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WORLD PETROLEUM

Control of Mosul Oilfields Ltd. Acquired by Iraq Petroleum Company • Government Inconsistency Revealed by Oil Company Indictments • Large Companies Show Tendency to Withdraw From Retail Marketing • Oil Possibilities in Austria • Company Attitude Toward Trailers

SEPTEMBER • 1936

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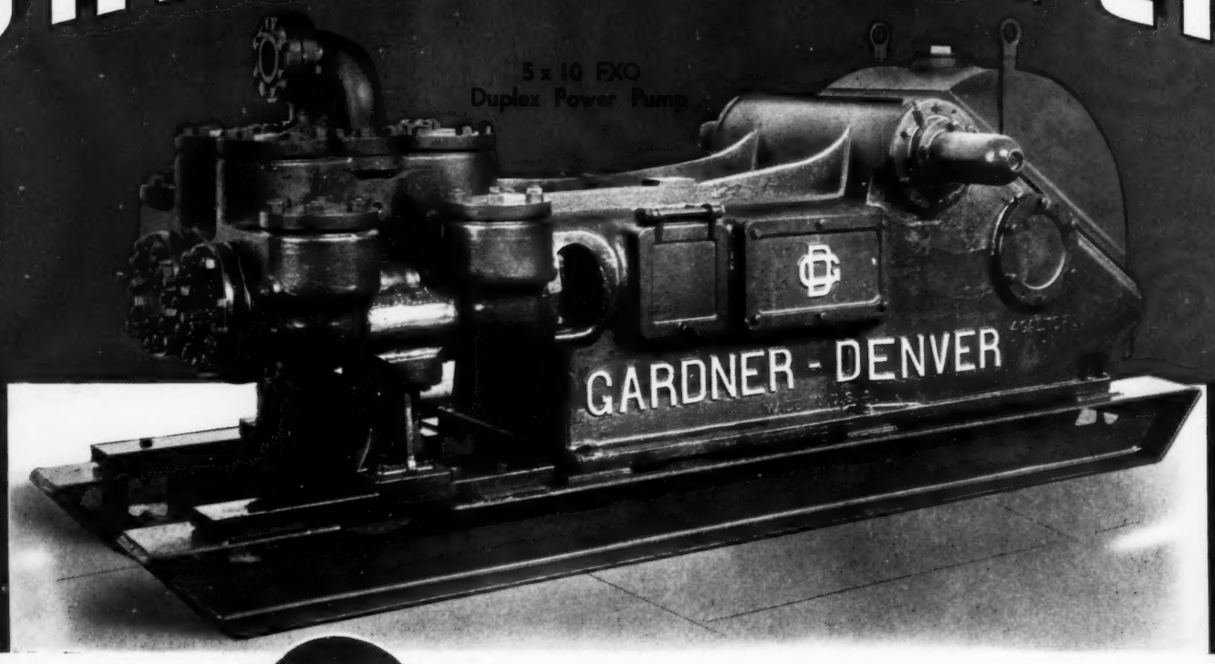

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SEPTEMBER
1936

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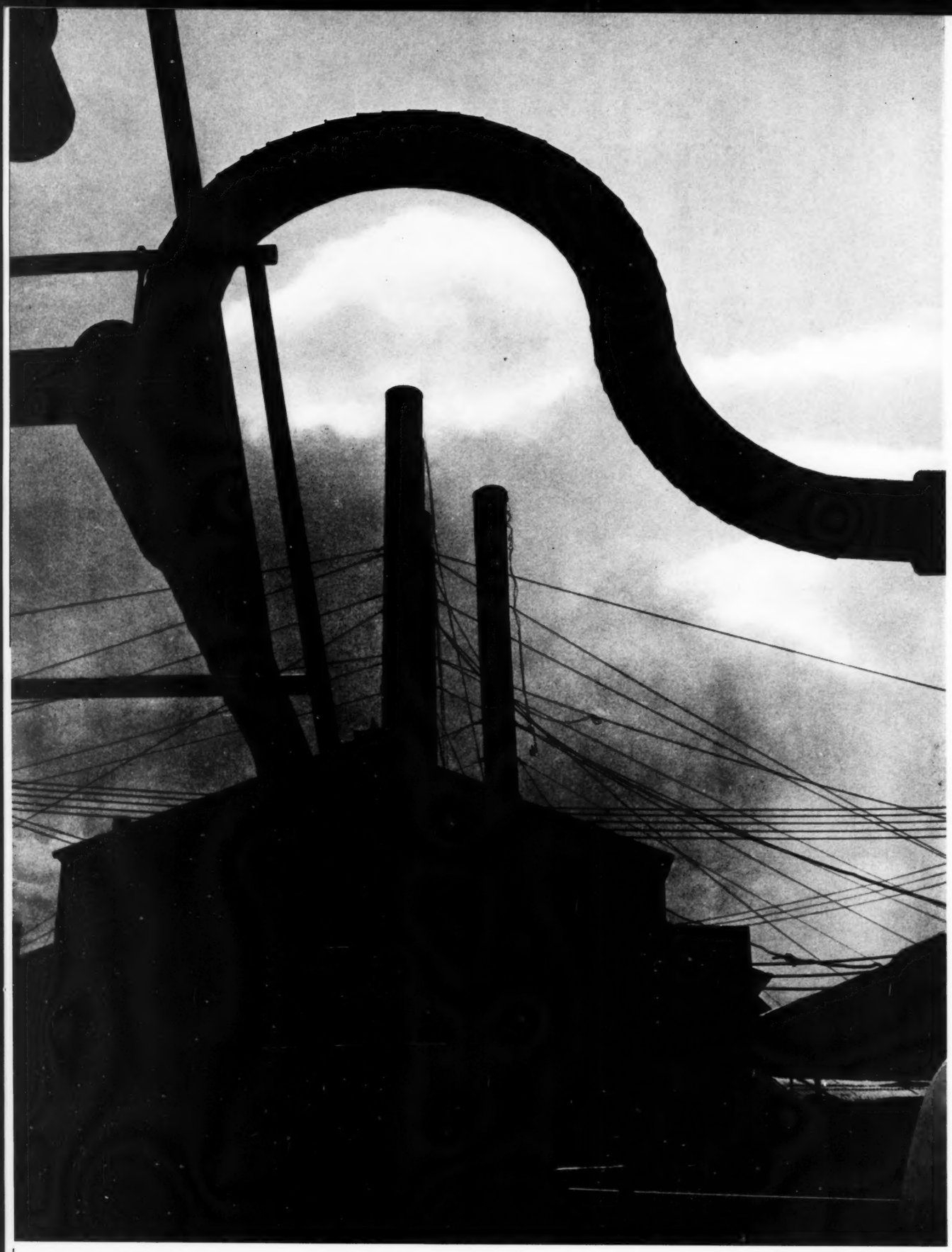

Texas gasoline plant near Borger: photo by Charles Phelps Cushing.

NEW YORK • WORLD • LONDON

PETROLEUM

Companies Leave Retail Field

TRANSFER of service station ownership or management to individual operators, as shown by an article published elsewhere in this issue, is proceeding rapidly in the United States. If continued at its present rate the larger oil companies with perhaps, a few exceptions, will be entirely out of the retail business within a very short time.

Various causes have contributed to speeding up this movement. In certain states anti-chain store legislation has been applied to retailers of motor fuel and by discriminatory taxation has forced oil companies to divest themselves of retail outlets. The area to which this condition applies, however, is relatively small as compared with the whole country. The fact is that for several years the trend has been toward individual rather than company operation of retail outlets though the movement may have been accelerated recently by observation that in states where the companies were forced to relinquish retail selling their business has not suffered. Where any difference is noted the net change has been for the better though this is not conclusive as sales have increased, everywhere.

Evidence of the tendency toward individual operation is provided by the final report of the marketing division of the Petroleum Administrative Board which has just been published. Statistics in this report extend no later than 1933, but a comparison between that year and 1929 reveals some significant facts. In 1933 the consumption of motor fuel in the United States, according to the Bureau of Public Roads, was 15,436,324,000 gallons or 953,563,000 gallons more than in 1929. The dollar value, however, was nearly 15 percent less in 1933.

Between the two years the number of service stations increased 40 percent and the number of employes 13 percent, but the number of proprietors of stations rose by 58 percent. In a special report of the Petroleum Administrative Board based on data supplied by all but two of the integrated companies operating in the United States the number of company owned stations at the beginning of 1933 was given as 35,952 while the same companies reported that they sold on a 100 percent basis to 177,929 outlets outside their own. These outlets of course included some not rated as service stations in the census reports such as garages, tractor and motor car dealers and other establishments where the sale of motor fuel was an activity subsidiary to some other line of business. Since that time several of the large marketing organizations have been steadily reducing the number of their company owned and operated stations until they retain only a few which for one reason or another it is impractical to sell or lease.

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Effect on Sales Methods

FORCE of circumstances rather than deliberate policy accounted for the entrance of the large oil companies into the field of retail merchandising. Most of them began establishing stations at a time when such action was needed in order to improve the inadequate service provided for the rapidly growing army of motorists. The great expansion in the number of service stations occurred in the decade between 1920 and 1930, directly following the close of the world war. The race for gallonage that took place during this period led to the erection of elaborate and costly service stations and to the provision of more and more extensive unpaid service for the purchaser of motor fuel. Expenses mounted far more rapidly than the growth in sales.

It was during this same period that the practice of loaning equipment to service station operators came into vogue, thereby making it easy for dealers to set up in business and intensifying the competitive struggle for gallonage. Average daily sales per outlet in 1933 were little more than 200 gallons daily or about half what they had been ten years before. While sales by company stations, because of the location and character of the stations themselves, were above the average many of them have been operated continuously at a loss.

It is obvious that an individual owner or lessee can conduct an ordinary service station at less expense than the same station can be run by an oil company. His initial investment is less and his cost of operation likewise is lower since he can personally serve his pumps or have members of his family do it without the limitation on hours and without other items of expense to which a company is subjected. As the average income from service station operation is somewhere in the neighborhood of $150 per month it is a business best adapted to the man who is satisfied to make his living on a relatively modest scale.

What effect the elimination of the large companies from service station operation will have on the business itself remains to be seen. Since the companies will post no service station prices

the operator will be free to sell as he pleases. He may make concessions to hold desirable accounts but since his own income depends on operating at a profit he will be chary of indulging in general price cutting and price wars should tend to become more strictly localized.

It is generally assumed that the service rendered at filling stations will be less elaborate than in the past but if this is a general condition the only sufferer will be the customer and in the opinion of many members of the industry he has been spoiled by over attention. The companies will lose the benefit of direct contact with the buying public through their own employes but few of them have taken full advantage of this contact heretofore. One obvious effect of the change is that as company control of the retail seller diminishes the companies will find it necessary to expand their advertising in order to create a broad consumer demand for their products.

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Portugal Considers Control

PORTUGAL is the latest of the European countries to be attracted by the proposal to extend governmental control over petroleum imports and supplies as a means of promoting national safety in time of war. As in the case of various other countries some of its legislators appear also to have been stung by the ambition to develop a domestic refining industry. Such at least is the conclusion to be drawn from a report to the Camara Corporation, upper chamber of the Portugese parliament, by a special committee appointed to investigate the subject, although the report itself is not very definite on the subject of refinery construction.

The committee has reviewed at some length the measures adopted in various other countries, notably France and Italy, to control petroleum supplies. It suggests the establishment of a system of import licenses, the compulsory maintenance by oil companies of reserve stocks equal to 30 percent of their yearly importations and the establishment of storage facilities approved by governmental authorities. It also proposes that the government, to enforce storage requirements or prevent excessive prices, may grant special privileges to private companies, particularly if these are operated by Portuguese nationals, and may extend financial assistance to such companies for the purchase of tankers or the building of refineries.

Requirement of a 30 percent reserve is something that the government probably could arrange with the companies now operating in the country as it would involve a relatively small increase in the stocks that they now carry. The other proposals, however, contain possibilities of defeating the very purpose for which they are ostensibly urged.

As WORLD PETROLEUM has pointed out on various occasions a nation without indigenous oil production is in a stronger position if it maintains open competition in its own market and leaves itself free to get its supplies where they can be best obtained in the quantities needed in times of emergency. When it extends special favors to one or more companies, thereby driving out others by making it impossible for them to compete, it narrows the range of sources upon which it may draw and so weakens its position.

Portugal's consumption of petroleum products is relatively small. It has no crude production of its own. Its total imports of petroleum products in 1935 were 170,000 metric tons, the greater part of which came from such widely separated areas as Roumania, Dutch West Indies and the United States. Were importations to be shifted from finished products to crude new sources of supply probably would have to be found. It is worthy of note that both France and Italy undertook their programs of refinery development only after they had acquired crude production and primarily as an outlet for such supplies.

Before entering upon a plan of governmental control Portugal would be well advised to consider all the implications and probable consequences of such a course. If this is done it may be found that the disadvantages outweigh any possible benefits that might accrue.

▼

Construction Costs to Rise

RECOVERY from the industrial depression has reached a point where it has carried the demand for certain basic commodities—oil and steel, for example, to new high levels. In the case of both of these the rise resulting from industrial demand has been augmented by the armament race now under way. All the larger European nations, as well as others outside Europe, are straining every resource to add to their fighting power on land and sea and in the air. They are doing this for defensive purposes of course, since no government ever admits that it harbors plans of aggression, but the result is to stimulate the activities of steel works and manufacturing plants which require steel for the wide range of products in which it is a chief constituent.

In the opinion of those most conversant with the situation the great outburst of activity which has taken place during the current year is likely to be reflected in higher prices and possibly in rapidly rising prices for all sorts of machinery and metal work. Price changes are no deterrent to military demands and industry must be prepared to pay more for its structural requirements than has been the case during the past several years.

So strong have become the demands of war work in parts of Europe that many manufacturing plants can accept private orders only subject to prolonged delay. This is not the case in the United States but the backing up of commercial contracts on these establishments may presently cause a like congestion there.

To the oil industry, which uses vast quantities of steel and alloy metals, this prospective development is of particular importance. It means that companies contemplating the construction of refining plants, installations of new equipment, the building of pipe line or other activities requiring steel in considerable quantity will accomplish substantial savings if they prepare their plans and place contracts for their requirements before the upward movement attains its full momentum. Otherwise a substantial addition to the cost of such improvements is likely to be encountered.

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Tarnish on the Jewel of Consistency

INDICTMENT by a federal grand jury in Wisconsin of twenty-three oil companies and more than fifty of their officials creates a legal question to be settled by the courts.

It also raises other questions of highly practical import to the oil men of the United States.

Does the present wholesale drive against the larger oil companies represent a change of heart on the part of the Roosevelt administration?

Or is it a repetition of the strange manifestation previously observed in which one department of the executive branch of the government pursues a course diametrically opposed to that followed by other departments?

Was not the purchase of surplus and distressed stocks of gasoline established during the regime of federal control and approved by appointees of the President charged with the supervision of petroleum affairs?

Did not these same officials encourage the oil companies to continue this practice after the collapse of the NRA?

If it is illegal for oil companies to purchase gasoline which they require in their business or even to anticipate future needs what hope is there of avoiding the price demoralization and waste that federal officials, from 1933 on, sought by every means at their command to remedy?

Can a price level lower than the one proposed by the Petroleum Administrator be properly designated as artificial and monopolistic?

Is it possible, as cynical Washington observers suggest, that political motives influence the government's course in dealing with one of the nation's most important industries?

Is the double cross to be adopted as the insignium of the administration's policy toward business?

THE charge upon which the mid-western oil men are arraigned is that they have "combined and conspired together for the purpose of artificially raising and fixing the tank car prices of gasoline in the middle West and that such prices were maintained at artificially high and non-competitive levels." The basis for this claim is that the companies concerned, by means of gasoline buying programs or pools, "purchased large quantities of gasoline from independent refiners at artificial prices which they sought to and did establish and maintain as the going market prices."

The link by which the two sets of transactions are connected in the indictment is an agreement between the oil companies and jobbers by which the tank car price charged the latter was determined by the spot price in the field.

Among the first concerns of the present federal administration when it took office in 1933, even before the birth of NRA, was to remedy the distressing situation in the oil industry. Crude oil was selling in East Texas at ten cents a barrel. It was recognized not only that this was a ruinous price, spreading demoralization and loss through the whole industry, but also that it involved disgraceful waste of an indispensable national resource. A conference was called in Washington in March 1933 to consider ways and means of ending this situation.

When the Petroleum Administration was formed under the direction of the Secretary of the Interior its immediate objective was to stop the waste by curbing overproduction and to advance the price of crude to a more reasonable level. The crude price was raised to a dollar a barrel by voluntary action of the oil companies who are the most extensive purchasers but it was done with the approval of the members of the federal administration who were directly in charge of petroleum affairs. It was done too with the expectation that an end to excessive and illicit production would permit an increase in gasoline prices since a crude price that is out of line with the price of products must inevitably be insecure. That the efforts of the Petroleum Administration to stop overproduction were not entirely successful and that the anticipated rise in gasoline prices was not fully realized is another part of the picture.

At that time the Petroleum Administrator was authorized by law to fix prices of crude oil and manufactured products. Secretary Ickes who held the post of administrator promulgated a set of prices which for various reasons never were put into effect. It was computed by experts of the Petroleum Administrative Board that a fair price per barrel for crude was 18½ times the cost per gallon of gasoline. On this basis and with an assumed price of six cents per gallon for gasoline the basic price for crude was put at $1.11 per barrel and this price was accepted by the main purchasers. Under the action and reaction of supply and demand, however, the six-cent price of gasoline remained unrealized.

The inadequacy of the spread between the two prices gave rise to complaints from independent refiners who had no crude production of their own. Between the upper millstone of a relatively low price for gasoline and the nether one of relatively high prices for crude they were pinched to the extent that some of them were forced to close their plants.

All this of course took place before the Supreme Court invalidated the National Industrial Recovery Act and cannot be quoted as a precedent for subsequent action. But here another noteworthy fact presents itself. Officials of the federal administration encouraged the oil companies to continue on their own initiative the course of action that already had brought about a marked improvement in the oil industry, an improvement that benefited particularly the independent producers of crude and the farmers and leaseholders whose royalties were determined by the selling price of oil.

Special stress was placed upon the importance of maintaining the price of crude. To support this price and to prevent a return of the chaotic and ruinous conditions of 1933 the purchase of distressed offerings of gasoline was first called into play under the Petroleum Administration and subsequently employed by the major companies. But for such purchases the crude market would have broken badly at various times. The big buyers might have profited directly from such a price decline, but they realized that demoralization of the price structure would be injurious to all in the long run.

At the same time members of the marketing branch of the industry, with the approval of federal authorities, have been laboring to work out a code of marketing practice that, without attempting to fix prices, would discourage unfair practices. This code, after extended consideration and discussion, is now before the Federal Trade Commission.

All of these efforts are directed to the promotion of stability and fair methods in the sale of petroleum products, the very objectives for which the federal government itself was striving in its period of

control. They are not intended to stifle competition. Anyone who is familiar with the oil industry knows that it is more keenly competitive than almost any other that deals with a staple product of universal demand. The fact is that the average retail price of gasoline in the United States has increased only 10 percent since 1933 despite the fact that the crude price has tripled in the same period. Hardly any other commodity can be mentioned that has not risen in price in greater proportion than this. An economic study of the oil situation suggests that if there is anything artificial in the present price structure the price of gasoline is artificially low in relation to that of crude.

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Attorney General Homer S. Cummings

When asked if he had anything to say to the question whether there was inconsistency in prosecuting oil men for doing what the government had urged them to do the Attorney General is quoted as replying, "Yes. Don't make me laugh."

While agreements to maintain prices are definitely forbidden by the anti-trust law everyone with the slightest experience in merchandising knows that in the case of staple commodities whether bread, sugar, gasoline or what not a common price level is a prerequisite of stability in any line of trade. The alternative is the kind of cut-throat competition that destroys values and inflicts loss on all concerned, even upon the consumer in the long run. In the past the oil industry unfortunately has engaged too often in just that sort of destructive competition.

Two significant facts appear in connection with the government's action in the mid-western cases. One of these is the bringing of criminal charges instead of the more usual civil suits. The other is the report from Washington that this case marks only the beginning of a drive that will extend throughout the country. For more than a month an inquiry has been under way in California and the Department of Justice looks hopefully to the finding of indictments there. The next move promises to be against the eastern sector of the industry. Another fact that may or may not bear significance is that the Secretary of the Interior, the cabinet member who has been most active in connection with petroleum affairs, denies all knowledge of the suits and asserts he did not even know that the cases were being prepared.

A startling aspect of the government's procedure in Wisconsin was the coupling of two publishers and their journals, *National Petroleum News* and the *Chicago Journal of Commerce* with the oil men in the conspiracy charge. The basis for indictment of the publishers rests on the fact that they published tank car quotations which the companies are alleged to have fixed by agreement. The complaint itself asserts that the prices published were the prices actually paid. What other prices could possibly have been used by any journal undertaking to report quotations actually paid, is difficult to imagine. While the publisher of *National Petroleum News* may occasionally have allowed his messianic complex to have impaired his dignity and prevented his publications from exerting the influence they should, he is undoubtedly a sincere man whose publication and price service have always been operated as a strictly honest piece of reporting for the industry. Certainly it would be absurd to suspect him of introducing other than actual sales quotations into the columns of his journal which apparently is the course that would have been necessary to satisfy the complainants. A very serious issue is involved in this phase of the case and one that affects every publication that prints market reports. However, this matter is distinct from the question of consistency in the government's attitude toward oil company officials.

The sequence of recent events brings into sharp relief the dilemma confronting the oil companies. Apparently the only choice offered them is to decide on which of its two horns they shall impale themselves.

If they follow the course marked out and urged upon them by the President, his Secretary of the Interior and other officials of the former Petroleum Administration they subject themselves to prosecution by another arm of the executive power, the Department of Justice. If they pursue the course necessary to avoid legal attack they will bring confusion and loss upon tens of thousands of members of their own industry and will be held up to obloquy as being incapable of managing their own affairs.

It is of course the duty of the government to see that attempts to create a reasonable stability in the oil industry are carried on by legal means. As previously mentioned this is an issue for the courts to decide in the cases now pending. To a layman, however, it would seem that the present concerted drive against the oil companies, and particularly the manner in which it is being conducted, serves notice upon the industry that it cannot continue its efforts to attain the very end that was sought by the federal government during its period of control over petroleum. In Washington, where political reasons are assigned by cynical observers to every action taken there have been rumors that the present move against the oil companies is by way of reprisal for their opposition to legislation that would establish complete federal control over their industry and to convince them that it is the part of wisdom to cease such opposition. It is hardly credible that the high minded officials who direct the nation's affairs would resort to such unworthy means to accomplish their ends, but it is evident, as it has been for many years, that there is need for some reconcilement between the terms of the laws set up to govern business and the economic standards recognized as essential to sound progress and stability.

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Harold L. Ickes, Secretary of the Interior

The former Petroleum Administrator told press correspondents that he knew nothing about the indictments of oil men by the Department of Justice. When asked whether this did not indicate a lack of team work in the Administration his reply was, "I didn't hear you."

Control of Mosul Oilfields Changes Hands

Shares Held by Italians Sold to Interests Associated With Iraq Petroleum Company Whose Representatives Are Added to the Directorate — Active Development of Mosul Area Anticipated.

NEWS of an important change in the Near East oil situation was contained in a brief statement issued from the offices of Mosul Oilfields Ltd., in London, on August 11. The statement was:

"The Azienda Generale Italiana Petroli having disposed of its interest in Mosul Oilfields, its representatives on the Board have resigned and the Board now consists of the following:

Viscount Goschen
Ali Jawdat Beg Al Ayoubi
William R. Brown
Lord Glenconner
P. L. Hunting
Paul Girod
Joseph Whiteside Boyle
John Skliros
Montague Piesse
Langlois Lefroy
Rene de Montaigu
Kevork Loris Essayan

"The reconstitution of the Board includes representatives for the several important oil groups which have acquired an interest in the company. The Board of the B.O.D. Company has been similarly reconstituted."

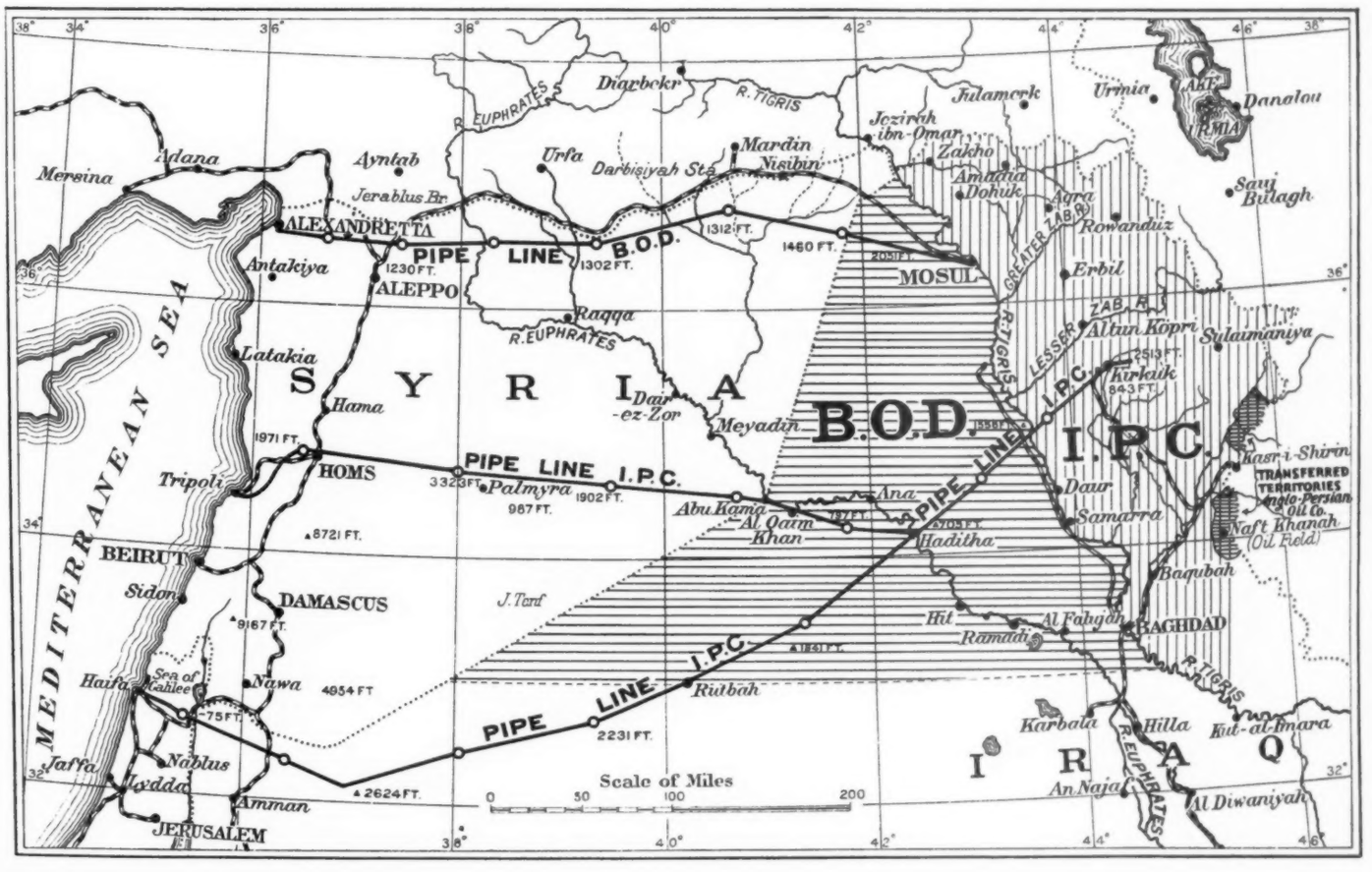
The significant part of the above announcement lies in the names and connections of the six last named directors, these being the new members of the Board.

Of these men Joseph W. Boyle is connected with the Royal Dutch Shell Group; John Skliros is managing director of Iraq Petroleum Company; Montague Piesse is a director of Near East Development Company, in which is combined the holdings of Standard Oil Company (New Jersey) and Socony-Vacuum Oil Company in Iraq Petroleum Company; Messrs. Lefroy and Montaigu represent respectively Anglo-Iranian Oil Company and Cie. Francaise des Petroles, and Mr. Essayan is connected with Gulbenkian Ltd.

These are the several interests composing the Iraq Petroleum Company and their appearance on the boards of Mosul Oilfields and British Oil Development Company indicates that a large and apparently a controlling interest in these companies has been acquired by Iraq Petroleum. The actual negotiation of the transfer of shares is said in London financial circles to have been conducted through Petroleum Concessions, Ltd., a subsidiary of Iraq Petroleum.

The eight directors who retired from the Mosul board and who had previously constituted a majority of its members were Prof. Umberto Puppini, Ettore Cafara d'Andria, Gr. Uff. Oreste Jacobini, On. Avv. Bruno Biagi, Dr. Francesco Zurlini, Ing. Giovanni Patrizi and Luigi Mariani. They had represented the holdings of Azienda Generale Italiana Petroli, leading Italian oil company closely associated with the government. Because of this connection a flavor of international politics is imparted to the recent transaction since it means not only the avoidance of commercial competition but also averts possible domination by Italy in the de-

(Continued on page 456)



Map of Iraq showing the Mosul Oilfields concession (B.O.D.) control of which has now been acquired by the Iraq Petroleum Company operating on the adjoining concession.

An efficient company-owned service station in New Jersey specializing in rapid service

Majors Abandoning Retail Marketing

Marketing Officials Express Opinions of Trend Toward Disposal of Retail Outlets by Leasing. Opinion Generally Favorable, But Official of Large Company Sees Numerous Disadvantages.

A NATION-WIDE program of withdrawal from retail marketing by major oil companies is now somewhere between 75 and 85 percent complete. This program represents the first major change in petroleum marketing since the establishment of the company owned service station some years before the war. The motives for this change in marketing may be fairly well tabulated; but the change has been undertaken so rapidly in a number of cases that it is not possible yet to determine what the results will ultimately be. It is, however, of interest to examine some of the opinions expressed by important marketing officials as to probable results as well as to immediate causes.

With one marked exception the general feeling seems to be one of relief. Many, if not actually most, of the major oil companies' complex problems arose from the marketing branch. Price cutting, not only by dealers but actually by salaried employees presented a baffling problem, incapable of easy solution. A collection of petty taxes, regulations and frankly adverse legislation made the situation more difficult. The larger operators of service stations were constantly subject to criticism from within the oil industry and complaints from their best customers on the ground that they were competing with those to whom they sold at wholesale. In addition, the integrated oil companies were running counter to the trend in American business in that they were manufacturers who engaged in retail distribution of their own product.

In the face of these problems and criticism, it may safely be assumed that many of the major oil companies had in mind for a number of years the question of withdrawing from the retail field. Action on this program was, however, postponed from year to year awaiting concerted action by the oil industry. All officials agree that almost insurmountable difficulties face companies that continue to operate their own stations when a majority of the larger companies have abandoned the retail field. Prior to the initiation of the present program, the converse was true; a company that disposed of its service stations might well find itself at a disadvantage in competition with companies who retained retail outlets. Nevertheless, a number of fairly large companies did dispose of their retail outlets or never acquired service stations. These companies appeared to be operating on a reasonable basis even before the present movement.

Large oil companies went into the retail field prior to the World War when they found that gasoline that was sold at refineries at 15 cents was being resold by garages at 25 cents per gallon. In addition to this exorbitant spread in price, it was found that a number of garages were further increasing their profit by blending distillate with the gasoline. The type of

service available at garages of the period was far below even minimum requirements—immeasurably below some of the fantastic heights of service that accompanied the sale of 60 cents worth of gasoline at a company owned service station in the recent past. The consumer was not receiving the benefit of savings achieved through technical improvements on the part of the refiner nor was he always getting gasoline of specifications equal to those that prevailed at the refinery. In order to improve this situation, encourage the motorist and control retailing to some extent, oil companies began to secure service stations, man them with salaried employees and proceed to turn out a class of free service that is not equalled by any other retail merchant dealing in units that average about 60 cents per sale.

It is true that at first a considerable margin of profit was available to company owned stations. One eastern company realized in the neighborhood of 20 percent on their investment in retail marketing when they first entered this branch of the petroleum trade.

In time price wars, over-competition, the struggle for gallonage at any cost, made the retailing of gasoline less attractive. By this time the oil companies had achieved their objective of raising the standard of service and the quality of products dispensed at gasoline stations and had succeeded in passing on to the motorist a large share (perhaps, even too much) of the margin that formerly went to the garage that operated a gasoline pump.

From an objective point of view it might have been considered time for the oil companies to return to the exclusive operation of their proper functions—producing, manufacturing and wholesaling petroleum.

Anti-chain store legislation was the incentive that actually got the larger units in the industry started on a program that other considerations had already led them to look on with favor. The point here is, that anti-chain store legislation applied to service stations, as in West Virginia and Iowa, was the immediate, but certainly not the most important, cause for the withdrawal of major companies from retailing. Anti-chain legislation proposed a progressive tax on multiple retail outlets; it was designed to eliminate the advantage enjoyed by the more efficient management and better bargaining position of the purchasing departments of chain stores. The logic of extending it to cover service stations is not readily apparent. On top of such legislation (which is at present confined to a few states) an indication of the present trend against chain operation is afforded by a bill which Wright Patman proposes to submit to the next session of Congress. Quoting from a letter of Mr. Patman's dated June 23rd, as reproduced in *Printers' Ink:*

> Dear Friend:
>
> The Robinson-Patman Bill has become law. I am sending you a copy. You have assisted in this great fight and I desire to thank you for your splendid help and cooperation. . . . I am considering introducing the following proposals at the next session of Congress:
>
> A bill to make it unlawful for a manufacturer to engage in retail distribution. I have such a bill prepared and am convinced that it will be constitutional as to all interstate transactions, which would make it almost 100 percent effective. . . . Your views and suggestions on these proposals will be appreciated. . . .
>
> Yours Sincerely
>
> Wright Patman

Where oil companies are engaged in disposing of their retail outlets, they seem to agree on a few fundamental principles. In practically all cases, the stations are leased to the operator on the basis of the operator paying the company a certain sum per gallon sold. This amount varies from less than one cent per gallon to as high as one and four fifths cents per gallon, depending on the location and estimated business of the station. In all cases the company ceases to post a retail price. A tank wagon price is posted and the dealer bases his price on that plus whatever he deems sufficient to carry on business. The stations are offered in the first instance to the present employee operating the station. If he is unwilling or unable to take over the station another dealer is found who is in a position to run the station. A deposit covering the value of the inventories on hand is required of the dealer, but this has not always been available. In no case are the stations sold: principally because the operators would probably not be able to find the money to purchase them. In states where there is no anti-chain store tax, the companies may write into the lease a provision assuring 100 percent account. In the states where there is an anti-chain store law this provision may not be possible. Also, in those states where separation must be complete, the company leasing the station will rely on the efforts of their salesmen to succeed in persuading the dealer to maintain the appearance and standard of service that the company has established. Training schools for station operators that have been in operation in the past should have a beneficial effect on operators who received their training there, even when it is no longer possible to continue the training courses.

The views of some of the leading repre-

Striking company service station on the Pacific Coast

sentative companies illustrate the situation. Standard Oil Company of New Jersey stated:

> First of the two primary factors actuating this move is the present desire of the Esso Marketers to leave the retail field entirely to independent dealers. Second, is the difficulty of continuing profitable retail operation under the many substantial and petty taxes to be paid, one of the most burdensome being the chain store taxes already in effect in some states and anticipated in others.
>
> As the company discontinues retail operation in various areas it will cease posting service station prices. It is expected that the dealers will base the price of gasoline at their own stations upon the tank wagon price plus a margin which each dealer deems necessary to carry on business.

Mr. C. G. Sheffield, of Jersey Standard, who considers the withdrawal of the company from the retail marketing field a healthy move, points out that company owned stations had become non-competitive due to the posting of a retail price. Further, as long as integrated oil companies engaged in posting retail prices, they would be subject to complaints from within the oil industry, if lower gasoline prices reacted unfavorably on crude oil prices. Complaints also arose from the companies' best customers, who resented the competition in the retail trade from the company that supplied them at wholesale. Finally, Mr. Sheffield considered that chain store taxes made operation impossible in the states that had adopted such legislation—and apparently the move to adopt chain store taxes is spreading. While service may not be maintained at exactly the standard required by the company owned stations, Mr. Sheffield felt that service had grown to fantastic proportions and a simplification would be beneficial all around. A retail chain extending from Maine to the Gulf was unwieldy in any case, said Mr. Sheffield. Had it been possible to adopt some form of profit sharing with the manager of the station, as is done in some cases by chain stores, the chain system of gasoline marketing might have been made to work. But a number of factors militated against successful profit sharing, as for example the rerouting of traffic, temporary detours, the advantage enjoyed by some locations regardless of the type of management they received from the operator.

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Dealer station in Detroit, Mich.

Mr. S. B. Eckert, head of the marketing division of the Sun Oil Company, also felt that the program was aimed in the right direction. He pointed out that the oil industry had been running counter to the trend in American business in that they had engaged in retailing the product that they manufactured. All Sun stations were expected to be in the hands of dealers by September 1. Sun encountered little difficulty in disposing of their stations, and while the quality of service available at the stations might not be up to the standard set by the company owned stations, it would be well maintained.

The Standard Oil Company of Indiana has found a considerable increase in sales in Iowa since completion of the program of disposal in that state; but it is not possible as yet to determine how much of this increase is attributable to improved general conditions and higher consumption of gasoline.

A high official of a Pacific Coast oil company stated that he would welcome anything that would take his company out of the retail trade. He cited, as examples of the impossibility of putting a stop to price cutting, cases where salaried employees were giving cash rebates out of their own pockets. Another example of the determination to cut prices was cited by this oil man: an out-of-state motorist presented a credit card in payment for gasoline and received 40 cents in cash from the station attendant.

An official of a Western oil company pointed out that leasing had been attempted on the Pacific Coast in 1928–1929. Price cutting had become so prevalent that it had resulted in almost wholesale bankruptcies, making it necessary for the company to take over the leased stations.

One of the most interesting views expressed was that of an official of a large oil company who fiercely resented attempts to make the oil companies dispose of their service stations. Despite the unanimous opinion of other oil executives that if a majority of companies withdrew from the retail field, any minority that persisted in remaining in that branch would suffer from the resulting competition from independent dealers, this official was apparently confident that his company would remain in the retail marketing field. He pointed out logically that he was at a loss to understand who would benefit by the withdrawal of the large companies from retailing: certainly not the independent, who would not welcome an influx of new independents who would compete for his customers—those who bought primarily on a price basis; nor would the company employees be in favor of such a move. They would not wish to sacrifice their present fair wages and security for the uncertainties, low return and long hours of independent operation. The public would not benefit as obviously the ultra service of the modern company owned station would be greatly modified. This official pointed to a comparison of the standards of living of company employees and independent operators, a comparison that was naturally favorable to the company employees. Thousands of families would be reduced to a lower standard of living if the larger companies withdrew from retailing. Independent operation meant long hours, cut prices, and lower income.

Domestic Crude for Austrian Defense?

Existence of Oil and Gas in Austria Has Been Known for Many Years but Only Recently Has Commercial Discovery Been Scientifically Undertaken.

By Dr. Hermann Vetters
Chief Geologist
Geological Institute of Vienna

THE Austria of today—reduced by the peace treaty of St. Germain to an area of 32,369 square miles with a population of 6,759,062—is a mere remnant of the former Austrian Empire. The possibility of finding oil in commercial quantities in this area has engaged the interest of various geologists since prior to the World War but definite assurance that such oil does exist has been obtained only recently. Six years ago, while drilling, a natural gas eruption occurred and a sizable quantity of crude oil (500 tons) was produced. Actual commercial production in Austria, however, dates only from November, 1932. The accompanying table shows production from that date to the end of 1935.

Crude Oil Production in Austria

1932 (Nov.–Dec.)	120 tons
1933	856 tons
1934	4,179 tons
1935	6,616 tons

Recent operations give promise of a further increase during the current year which, it is hoped, will put an end to the scepticism that still prevails on this subject.

The presence of natural gas in Austria has been recognized for some time. The present major source was first encountered in 1891 during the process of drilling a water well in the city of Wels. Since that time natural gas has been produced from more than 150 water wells in and around Wels at depths of as much as 350 meters and used in a small way for fuel and illuminating purposes. As the gas occurs in larger or smaller lentil-like sand formations the productivity of most of the wells is not of any great quantity or duration. Several large blow-outs, however, have resulted in a total loss of 30,000,000 cubic meters of gas. Total production of natural gas to date from the Wels district is estimated at about 90,000,000 cubic meters.

Natural gas was found as early as 1844 in the city of Vienna itself, while drilling an artesian well, but the well was exhausted by 1846. In Bad Hall, where iodine- and bromine-water seepage occurs, natural gas has been known since 1852 and lately this production is again being utilized.

Gas production is obtained in numerous places in water wells or borings in the foothills of the Alps (Alpenvorland). This production is concentrated in the large district around Wels, the region of Amsteten, Enns up to Linz, and the upper Austrian-Bavarian border district, gas being produced commercially in several sections of eastern Bavaria.

TODAY, with Europe assuming the appearance of an armed camp in which an incident, unimportant in itself, would be sufficient to ignite a conflagration that would consume Europe and perhaps spread to other quarters of the globe: today, when national security in Europe and perhaps elsewhere, depends primarily upon the strength and effectiveness of a nation's armed forces, the question of supply of raw material and particularly supply of petroleum is of the first importance. To Austria, finding itself in the center of the most belligerent European countries, believing itself to be approaching a larger destiny than that assigned to it by the Treaty of St. Germain, an indigenous oil supply is vital. Not only to Austria, but to the rest of the world, Austrian oil may some day be of greater importance than the limited nature of its probable reserve would indicate in a strictly economic consideration. World Petroleum is privileged to present herewith an evaluation of Austrian oil reserves by the distinguished geologist who suggested the existence of crude oil in commercial quantities many years before Vienna officials showed a disposition to investigate.

Two deep wells were completed in the upper Austrian Schlier district by the European Gas & Electric Company after preliminary geological and geophysical investigations. Though the well at Gunskirchen, southwest of Wels, reached a depth of 545.5 meters, and the other at Willing, northwest of Lambach, a depth of 679 meters, neither showed any satisfactory results.

Traces of oil have been found in the Schlier district (Alpenvorland) a number of times when drilling but never in large quantities. A well drilled by the government in 1902 near Wels went through several gas horizons without striking any crude oil. It went down to the crystalline rock area which was reached at 1,036 meters. Subsequently, in the region of Schärding (near Taufkirchen), Leoprechting and Winetsham several wells were sunk to depths of 120, 170, 173 and 214 meters. Just above the underlying rock area a heavy thick oil was struck in the sand and 1,800 quintals was bailed out (1 q=220.46 pounds). In an attempt to recover the oil in the usual manner difficulties were encountered upon deepening the hole. Work was finally stopped before the hole reached oil-carrying sands owing to a disagreement between the financial backer and the operating concern. The oil was, however, of an excellent quality for manufacturing light and superheated cylinder oils. The quantity was estimated at 60,000 tons.

This production, though it is of no practical value, is nevertheless important as it answers the question of whether crude oil, as well as gas, is present in the Schlier beds. The oil found was not formed in the sands over the crystalline but immigrated from the adjoining Schlier beds.

The main point of interest today, however, as regards oil and gas production is not in the Alps foothills, but the inneralpine tertiary basin of the Vienna basin. Attention was first centered on this area in the year 1913 in Slovakia (at that time this part of the Vienna basin still belonged to Hungary), when oil was located in the shallow Samaratian beds. This deposit was found, by chance, at Egbell (today

Gbely) at a depth of only 163.5 meters, and the discovery caused quite a sensation in geologic circles. It must be remembered, however, that in adjoining Moravia, near Göding, oil traces and combustible gas had been discovered 12 years previously in the same layers while drilling for water at 217 meters. The population at Gbely had known about the escaping gases for some time and it was, in fact, an attempt to utilize this gas (which was followed by an explosion) that lead to the first drilling.

Today Gbely has, in two adjoining fields, more than 400 wells which produce Saramat oil at depths of from 210–250 meters in the old field and at 120–160 meters in the new field. Daily average production amounts to 400 quintals but the producing wells are not fully utilized. Total production up to the end of 1934 was more than 19,000 cars (1,990,000 quintals) of crude oil. Natural gas production, which has been measured only since 1921, to the end of 1934 amounted to 6,700,000 cubic meters, and originates partly from older deposits—especially the marine miocene formations.

In the Moravian part of the Vienna basin, near Göding (Hodonin), oil production was not realized until 1924, after drilling the fifth well. The oil was found in three horizons of the Samaratian beds, the top ledge of the marine Tortona and, more recently, a fifth deposit was opened in the Tortona. Total production to the end of 1934 was 10,500 cars (1,050,000 quintals). Yearly production has varied considerably, amounting in 1925 to about 1,600 cars, after which it decreased, finally again reaching the original output.

As has been already mentioned, oil production in the Austrian part of the Vienna basin was not started until a later date.

In his first publication the discoverer of the Egbell oil pool, H. V. Boekh, pointed out that the presence of oil could be anticipated in adjoining areas of Austria. The writer, who was fully in accord with this conviction after studying the Austrian oil question since 1914, at that time designated the district of Steinberg—where producing wells are now located—as oil-bearing territory. Prospecting work in Steinberg, however, did not start until many years later. The selection of the first prospecting point was quite difficult as direct indications, such as the gas eruptions at Egbell, were lacking. Surface geology in the region adjoining the Slovacian oil field gave no insight to the stratification of the tertiary due to subsequent deposition, and it was here that the continuation of the Egbell oil strata was sought.

Encouraged by the unexpected discoveries in Slovacia it was decided first to exploit northern Lower Austria where, as in Egbell, the oil-bearing Sarmatian beds are covered by congeries rich in clay. The prospectors were doubtful about districts where the older beds could be seen on the surface, as in Steinberg on the Mediterranean. A further handicap to initial success was failure to drill sufficiently deep. It was anticipated that it would be necessary to drill deep, as at Egbell, but not to such great depths as the producing wells finally showed.

Consequently, drilling at Hohenau and Rabensburg was halted in the Pannon bed without reaching the Samaratian bed (having drilled to depths of 411 and 314 meters, respectively). Oil traces were found, however. At St. Ulrich drilling was initiated at the crossing of two faultlines, but the operators ran out of hole at a depth of 630 meters after striking traces of oil and combustible gases. Had it been possible to go down about another 300 meters the results would probably have been as satisfactory as the first productive well at Gösting.

After the war drilling in this section of the Vienna basin was interrupted for some time. During this period frequent criticisms appeared in the newspapers concerning the inactivity, particularly in view of the continuous progress in oil mining which was being made in neighboring Czechoslovakia.

Once again, a chance occurrence centered the attention of geologists and oil men on the district south of Vienna. During a shortage of coal, drilling was undertaken at Maria Lanzendorf for soft coal. In one of these borings, at a depth of 600 meters, a gas eruption took place with an initial yield of 10,000 cubic meters daily. The gas, which was methane with two percent heavy hydrocarbons, originated from the congeries formation and blew into air for several months. Further drilling to 617 meters resulted in additional gas and traces of oil. No action was taken at the time but subsequent geological investigations led to the assumption of domes over the apex position. Later the existence of a deep and nearly north-south shift was ascertained.

The next deep-drilling was undertaken northwest of Maria Lanzendorf by the newly formed Wiener Erdöl A.G. A final depth of 1,113 meters was reached and gas and oil traces were struck several times.

Subsequent to the two aforementioned unsuccessful attempts of the European Gas & Electric Co. to achieve gas production, thorough geological and gravimetric investigations were made which led to drilling west of the original shift near Oberlaa. During 1932 rich gas was struck in the Tortona sands at 266 meters. The nearly pure methane gas had an initial production of 50 cubic meters per minute at 37 atm. pressure. In the same formation a third hole, somewhat to the east, struck gas at 290 meters in 1933. In 1934 the gas was being delivered to the Vienna Municipal Electric Plant. By the beginning of 1935, however, delivery had to be stopped due to insufficient pressure, but not before 13,500,000 cubic meters had been delivered and 2,000,000 cubic meters had been used by the Eurogasco themselves. Other drilling in this district yielded no productive quantities of gas, showing that the abundant gas yield was restricted to limited lentil-like sands in the neighborhood of the shift.

Drilling in an indicated dome at Enzersdorf on the Fischa again brought proof of rich gas deposits. While drilling the first well in 1935 through the Sarmatian formation a violent gas eruption occurred at 700 meters which destroyed all the drilling machinery. A second hole was drilled in the same section to a depth of 1,533 meters. Several gas horizons were passed in the Sarmat and Tortona formations, but it was not possible to separate the gas from the water. A well sunk by Eurogasco during 1936 near Podersdorf (on the east side of the Neusiedler Lake in Burgenland) reached a depth of 378 meters in the crystalline subsoil without, however, finding more than mere traces of gas.

Up to the present, then, Austria has gas production only in the Welser district, except for small quantities found in other places yet to be discussed which, for the greater part, have not yet been utilized. Nevertheless, there is sufficient foundation for the belief that gas in commercial quantities will eventually be found in the vast neocene-formation areas contained in Austria.

Of far more importance is the question of crude oil reserves in that part of the Vienna basin lying north to the Danube. As has been already mentioned, actual prospecting in this district has been at a standstill for some time, but geological investigations carried on by the writer (and later continued, in particular by K. Friedl) definitely show that—as in the case of the oil fields of Moravia and Slovacia—flat dome shifts play an important part in the tectonics of the region. The few borings taken were in sections far distant from those drilled during the war. Typical examples are the well at Wollmannsberg, already mentioned, and the well at Unter-Oberndorf, north of Wolkersdorf, in 1925. The latter, after drilling through Sarmat and Tortone, reached slate formation at 400 meters. The operators, at that time not wishing to risk drilling at random for oil in slate for-

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The first rig on an Austrian oil field near Zistersdorf, one of the first commercially successful oil fields

mation, abandoned the hole at 491.5 meters, though on the basis of present experience the hole would certainly have been continued. Even so, slight traces of gas and iodine salt water were ascertained.

At this time the already discussed area of Steinberg, near Zistersdorf, gained new interest. As has been mentioned, this hill contains Leitha lime as well as a Tortona formation which sinks below the younger Sarmat formations toward the west and north. Toward the southwest the calcareous formations are cut off by a break (Steinberg quarry). Geological observations have now shown that in the easterly-sunk wing the pliocene formation (Pannon stage) forms a flat anticline migrating along the break. Its exact course has been followed up only recently by hand-operated drilling.

At this time (1929) the two concerns which prospected jointly in Unterolberndorf (Gewerkschaft Raky-Danubia and F. Musil with his newly established Steinberg Nafta Ges) started drilling in the east at the foot of the Steinberg. Both wells were drilled in such a manner that they should have reached the Sarmat on top of the anticline. The well in the Steinbergwalde (Musil) got stuck at 333 meters in Pliocene without having struck any substantial oil or gas traces, although hand-operated borings previously made had shown fair gas and oil traces. (Probably they were located close to crevasses.)

The well started by Raky-Danubia at Windisch-Baumgarten caused a great surprise. It went down to 338 meters through pliocene formation and then immediately struck the slate formation covered up completely by one of the neocene formations of the migrated new Alpine-Carpathian sandstone zones. From 680 to 719 meters, in clefts of the hard slate sandstone, oil drops appeared. On making an attempt at bailing, a gas eruption of long duration took place which carried with it about 50 quintals of paraffin containing light oil. Dr. Raky's decision to continue drilling, though there were no further prospects of finding sarmatian oil, led to the first substantial production of crude oil.

The long-expected production from the sarmatian formation, however, did not materialize—either then or in subsequent borings. Raky-Danubia and the new Erdölproduktionsgesellschaft E.P.G. drilled jointly in the Community Gösting. At 705 meters the slate formation below the pliocene was struck. At 733 meters large quantities of gas (20,000 cubic meters per day) were reached and later on, in the slate formation clefts, fair traces of oil turned up. After reaching a depth of 785 meters an attempt was made at bailing and a heavy brown oil flowed automatically with an initial daily production of 250–300 quintals. In all, 112 cars (11,200 quin-

tals) of this oil were produced in the years 1932–1934.

After the flow of oil ceased the well was deepened to 926 meters, as a result of which oil was found in the crevasses of the slate formation. The water was shut off and this well has been producing again since August, 1935. It gives a lighter paraffin oil, containing some benzine, nearly equal to the Windischbaumgartener of 1930. Production at first amounted to two or three tons daily while more recently it has decreased to 800–1,000 kilograms, but it must be remembered that the drill-hole is of only three inches diameter.

The Gösting No. 2 well of the E.P.G. was drilled still further east on the sloping Steinberg and struck sarmatian and oil-producing sands below the pliocene at 872 meters. It has been producing since August, 1934, from a depth of 926 meters. Initial production was at the rate of three to four cars daily. Current production is from a higher horizon at the rate of one-half car daily and total production to date is approximately 1,000 cars (of 100 quintals each) of oil.

Gösting No. 4 was drilled nearby and reached oil sands at about 1,100 meters, but did not disclose any appreciable quantities of oil. Consequently, a diagonal boring from the same rig with a two percent incline towards the west was sunk and struck the oil horizon at about 24 meters higher than the original boring of well No. 4. During the past year approximately 5,168 quintals of oil have been produced.

Recently Gösting No. 4 was further deepened to 1,290 meters with satisfactory results. It reached, in all, 10 oil horizons, and from the lowest horizon (after shutting off the water) an oil eruption under high gas pressure occurred. The oil, however, was mixed with a great deal of fine clay sand, causing the drill-hole to become continuously clogged up. A two-inch tubing will be installed to correct this. At any rate, a daily production of six cars (600 quintals) has already been attained. A new well has already been started somewhat to the west.

Still in the experimental stage but very promising are the results obtained from a well located northwest of the Community of Neusiedl. It passed through the sarmatian between 967 and 1,174 meters without finding oil, then in the slate formation an oil considerably lighter than any yet produced in the district was found. At present the oil column is 800 meters high and baling will begin very shortly. Two cars of oil have already been brought up for test purposes.

Less successful was the well of the new Rohölgewinnungs A.G. (Shell-Vacuum) R.A.G. No. 1. After various hand-drilled tests this well was started southeast of Gösting No. 1. It reached the sarmatian formation at 854 meters but oil was not struck until 1,015 meters. Two cars of pure oil were baled out, but then water began seeping in and attempts to cement off were unsuccessful. The hole is now 1,024 meters deep in the slate formation and shows traces of oil.

All these wells are situated on the eastern slope of the Steinberg. Only one well, Prinzendorf No. 1 (Musil & Co.) is located on the top of the hill which consists of Tortona and Leitha lime formation. It has gone through sand and clay with gas and oil traces, and from 575 meters down (in the Schlier formation) has found natural gas in nearly all sand horizons, its gas production having been estimated at 10 cubic

(Continued on page 454)

▼

Drilling Handbook Fills Long-Felt Need

ROTARY DRILLING HANDBOOK, by J. E. Brantly; published 1936 by Palmer Publications, Los Angeles and New York. 304 pages, 45 figures. $3.50.

As may be inferred from the title, this book relates not to drilling in general but to rotary drilling in particular. No other method of sinking an oil well comes into consideration. The author has only one tale to tell and that is how to drill an oil well by rotary methods. In other words, the book is addressed to specialists in rotary drilling. And by specialists in rotary drilling is meant the hierarchy of individuals who have to do with rotary drilling equipment, from the petroleum engineer through the drilling superintendent and the driller on down to the rig helpers and other roughnecks whose daily interests center about rotary drilling rigs.

It may reasonably be required of a man who essays to write effectively for practical drilling engineers that he himself should have had long and intimate contact with the things and the problems with which the rotary drilling profession has daily to wrestle. In this respect Mr. Brantly appears to have superior qualifications. Besides being a graduate mining engineer and geologist and a former teacher of these subjects, he is a practical oil man of many years experience; and this experience has not been of a casual or incidental nature but is that of a drilling contractor who has repeatedly staked his resources of capital and knowledge on the execution of difficult drilling jobs. Here is a man who is obliged to know how oil wells are drilled by rotary methods, and on whom has long rested the ultimate responsibility of reaching decisions and issuing instructions. We are told that in fact this book has grown out of a compilation of data and instruction sheets issued to drilling crews of the Drilling and Exploration Co., Inc., and which eventually acquired such a form and content as to raise a demand for their publication in book form.

The book is therefore one that is written primarily for those engaged in the business of actually drilling oil wells. No technics of engineering are admitted except such as are readily usable, and no space is wasted by descriptions of simple and obvious operations. The driller's problem is put before him in clean cut terms: It is required of him to sink a hole in the shortest possible time consistent with (note that phrase, *consistent with*) safety and the efficient use of power and tools. If the driller is to perform his job creditably and satisfactorily he should know or be instructed in the construction, uses, functions and management of prime movers, circulating pumps, derricks, engines and draw-works, rotary tables, feed controls, derrick equipment, wire lines, drilling shafts, bits and other mechanical accessories of his trade; he should have an intelligent understanding of lubrication, drilling fluids, weights to be carried on bits, the use of instruments, how to measure pipe, the art of directional drilling, and the unwelcome pastime of "fishing" to which oil men are often summoned; he should understand casing and cementing; the considerations that govern hole size and depth, and what safety measures are appropriate and necessary about an oil well. Further, even the roughnecks who putter around a rotary rig should have some understanding of oil geology and the principles of formation testing.

All this is set forth in 25 lucidly written chapters. A notable feature of the book is that in describing drilling equipment Mr. Brantly freely criticizes existing types and warns the practical man of their deficiencies, and in so doing he provides manufacturers of drilling equipment with food for thought.

There are 92 pages of tables and formulas for the driller's use, and a glossary of terms. It is a book to be owned and used by every rotary driller.

Are Oil Companies Apathetic to the Trailer?

Estimates That the End of 1936 Will See Many Thousands of Automobile Trailers in Use in the United States Provoke Question of Providing Trailer Parks and Other Facilities.

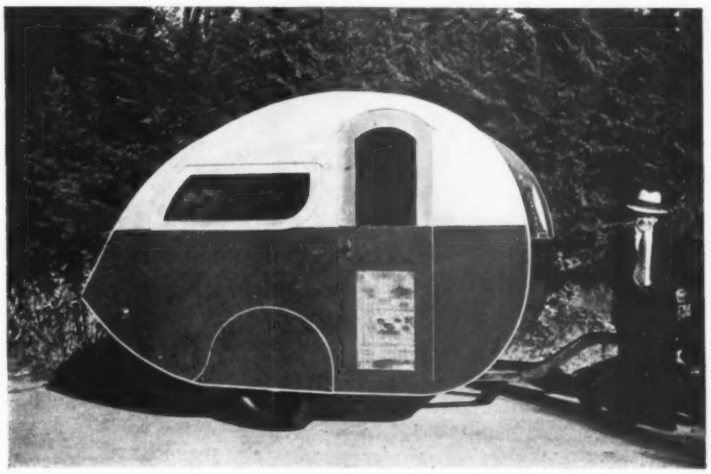
LIFE on the open road in a house trailer, hauled behind the family automobile, is gaining momentum throughout the United States. Implications in this nomad trend are of interest to the petroleum industry. Hauling a trailer adds an additional ten percent to gasoline and lubricating oil consumption, according to users. Trailers are equipped with gasoline stoves and in some instances gasoline lighting equipment.

Then there is the question of trailer parks. House trailer manufacturers and the caravaneers themselves are beginning to ask what the oil companies are going to do about it.

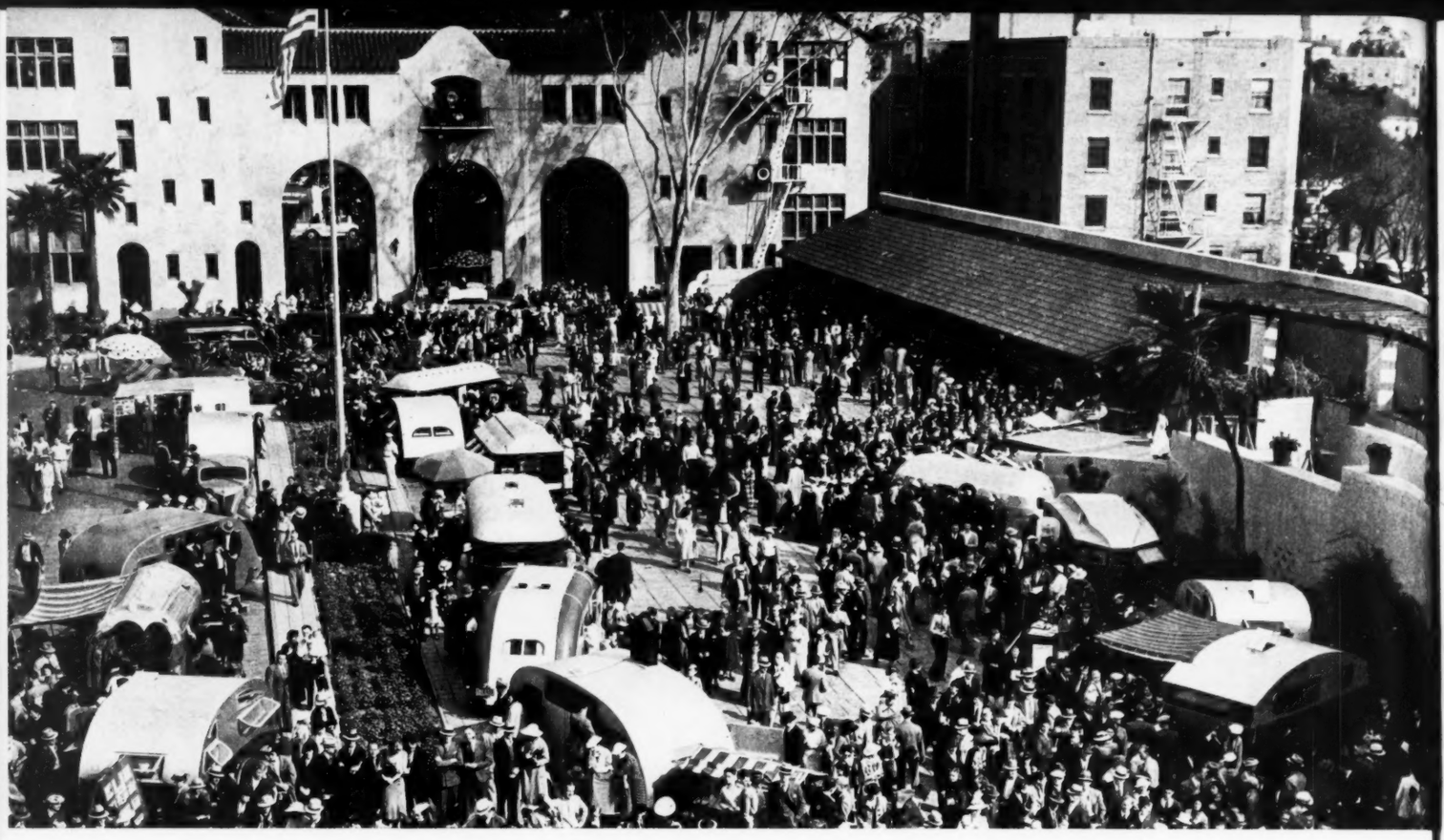
According to Roger W. Babson, this trend toward life on wheels in America is growing apace. After a survey of the situation in the trailer building centers in the Great Lakes area and trailer camps as far south as Florida, Babson wrote that "within twenty years more than half the population of the United States will be living in automobile trailers." In his survey, Babson deals with causes behind the movement, pointing out that today a man with fixed abode finds himself in the grip of his employers, is confronted with much fixed expense and increasing taxes. He mentions such items as being unable to avoid objectionable neighbors or erection of unsightly structures near-by. Once in a trailer home, he can pick up and leave.

Inquiry among manufacturers reveals their estimate that by the end of 1936 there will be a million house trailers in use in the United States. Conservative figures may be nearer 500,000. Either figure means a considerable population on wheels. But not all of these will be permanent trailer dwellers. Users of this type of dwelling are divided into two classes, vacationists and caravaneers. The latter claim attention not only of local and state officials but among those who supply their requirements, including the purveyors of gasoline and oil.

Trailer manufacturers in California have organized and are trying to offset legislation unfavorable to trailer owners. This covers regulations on the trailer itself and conditions under which it can be parked in rural and urban communities. The California state board of health has suggested a model ordinance which if adopted, would keep the present type of trailer out of cities. It is being fought In contrast, Florida welcomes caravaneers and is well in the lead in providing trailer parks. The question has been raised by trailer owners themselves as to the



Present-day types of trailers range from the small, unpretentious rolling bed (shown on the right) to the more costly and elaborate homes-on-wheels pictured left and on the following page. The number of trailer enthusiasts is increasing annually and the question of trailer parks and appropriate facilities must soon receive the attention of either the oil companies or the individual states.



An idea of the keen interest aroused nowadays by the possibilities of trailers can be gained from this photograph, taken at the 1936 Trailer Exhibit at Southern California Auto Club.

position of the oil companies on trailer parks and kindred subjects. Present facilities for automobile tourists and caravaneers outside of Florida are limited to auto camps with sleeping facilities and more or less unimproved parking lots. Preliminary inquiries are being made to find out whether the oil companies will take the initiative in providing service for caravaneers or merely follow the rapidly growing caravan

A survey of oil companies in Southern California shows a tendency at the moment to let the matter drift. House trailer owners who have made cross-country trips say that service station attendants of The Texas Company have been very helpful in providing overnight use of sanitary facilities. Wash rooms were left open and house trailers allowed to park alongside or even in the driveways of the station after closing hours. Inquiry at The Texas Company headquarters in Los Angeles developed the interesting fact that this courtesy on the part of station attendants is on their own initiative, no policy having been laid down by the company. Promotional executives of Texaco, Union and Richfield Oil companies stated they were just becoming aware of the trend toward use of house trailers as a permanent abode and had not yet decided what to do about it. A manufacturer of house trailers says he has written the Standard Oil Company of California inquiring about that company's attitude toward the trailer business, without response. Discussion with officials of the oil companies brought out the suggestion that they had noted increased number of trailers on the road but felt that their use may be just a passing fad, or a temporary effect of the depression.

Widespread distribution of Babson's comment in a SATURDAY EVENING POST article on the nomad trend, together with reference to the same subject in TIME, meetings of the "Tin Can" Tourist and the Auto Tourists Association, and trailer shows has brought the caravaneer to the fore. Automobile distributors in the southwest have shown their cars with trailers attached in recent exhibits. Traveling salesmen use them to some extent as do workers on projects like construction of the Los Angeles aqueduct but for the most part, according to trailer builders, the caravaneers are retired business people who have set out to see the country.

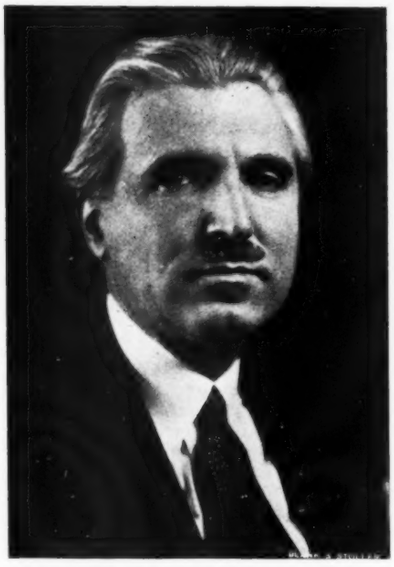
Whether establishment of trailer parks in the neighborhood of large cities will become a necessity remains to be seen. Need for such facilities in the vicinity of resorts and in conjunction with special attractions such as the San Diego Exposition has already been shown.

Babson in his report suggests that trailer park facilities for traveling Americans will eventually be supplied by the states. Both trailer builders and trailer users in Southern California point out that this will put them right back in the hands of the politician and the tax collector, from whom trailer users seek to escape. They suggest that trailer parks might well be provided by the oil companies as an extension of service now rendered. They point out that properly equipped trailer parks adjacent to the source of supply for gasoline and oil would mean added gallonage and that the park itself would show a profit. Users suggest that a well run park with lawns, shower baths, sanitary facilities and provision for service by local merchants, including the laundry and ice man, could be maintained on a simple basis. Whether such service is within the scope of company operated service stations is yet to be passed upon by the oil companies.

Interviews with trailer manufacturers show them hard pressed to keep up with the demand for rolling homes. The caravaneers are coming and the question of the moment is "What, if anything, are the oil companies going to do about it?"

Foreign Oil Legion

CHARLES E. ARNOTT, vice president of Socony-Vacuum Oil Company, and Mrs. Arnott are spending a vacation in Europe.



Charles E. Arnott

Mr. and Mrs. Arnott sailed from New York late in July and are not expected back until sometime after the middle of September. They expect their journey to carry them as far as Istanboul with a visit to the Bayreuth festival before their return.

C. TALBOT LONGCROFT, assistant London manager of the Oil Well Supply Company is at present visiting oil equipment manufacturing plants in the United States for the purpose of studying the latest developments in drilling and production equipment.

ROBERT L. HAGUE, head of the marine department of the Standard Oil Company of New Jersey, arrived in London from New York early in August.

L. C. QUACKENBUSH, president of the Alliance Oil Corporation of New York returned to New York from Europe on the SS. NORMANDIE toward the end of August. Mr. Quackenbush had been in London engaged in the formation of the Alliance Oil Corporation Ltd., of London to handle European operations of Alliance. He reported that the directors of the newly formed company would be Mr. F. R. Allnutt, Mr. W. J. Allnutt and himself. The British company has established bulk plants and offices at some of the principal Continental and British ports.

CAPTAIN J. W. FLANAGAN of Toronto, President of Andian Pipe Line Company, sailed from New York on August 12 for a vacation trip to Europe from which he expects to return in October.

M. BARINOV, head of Glavneft in Russia, returned to the U.S.S.R. from the United States early in August on the SS. NORMANDIE. Mr. Barinov was accompanied by the Russian commission with whom he had been studying drilling and refining technique in the United States since April of this year.

Kenneth R. Kingsbury

KENNETH R. KINGSBURY, President of Standard Oil Company of California, Capt. T. Rieber, Chairman of The Texas Corporation, and James A. Moffett, Chairman of the California Texas Oil Company Ltd., are spending several weeks in Europe engaged in a survey of the oil situation there.

HERBERT L. PRATT, chairman of the board, Socony-Vacuum Oil Company is spending some time at East Lothian, Scotland during the grouse shooting.

Herbert L. Pratt

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World Petroleum Abstracts

Summaries of the Most Important Articles as Published in the Oil Press of the World Dealing With Technical and Economic Aspects of the Industry. *Edited by Dr. O. W. Willcox*

Petroleum Geology

Report on the Fitts Pool.—Don L. Hyatt, in BULL. AM. ASSOC. PETROLEUM GEOLOGISTS, vol. 20 (1936), No. 7, pp. 951–974.

The Fitts pool, classified as Oklahoma's latest major pool, has an estimated ultimate yield of 100,000,000 barrels. It has opened an area for potential oil fields in southeastern Oklahoma, which had previously been considered unfavorable for the accumulation of oil.

The first structure making movement of importance occurred at the end of Wapanucka time; the area was faulted, accompanied by folding and some erosion. Progressive faulting and folding continued during lower Atoka time as the area was undergoing gradual uplift during deposition. It became a positive element in about lower middle Atoka time when it received its greatest amount of uplift. Except for minor oscillations, the area remained a positive element until Middle Pennsylvanian time.

The structure of the Fitts field is a faulted anticline, which lies within the Franks graben. Accumulation is controlled by a major east-west fault and associated cross faults, post-Wapanucka in age. The field is controlled on the west and the south by faults, on the north by dip of over 500 ft. to the mile on the subsurface formations, and will probably be controlled on the east by regional dip.

Micropaleontology of the Caucasian Oil Fields.—Martin F. Gloessner, in PETROLEUM, vol. 32 (1936), No. 27, pp. 5–12.

Much work is being done on the micropaleontology of the Caucasian oil fields by a large number of special investigators. The various horizons have been defined and formations in widely separated oil fields have been correlated on the basis of characteristic occurrences of foraminifera, radiolaria and ostracoda; it has even been possible to make some correlations with formations occurring in Alpine Europe and others as far away as Texas and Mexico.

Source Material for Petroleum and Natural Gas.—Wilber Stout, in BULL. AM. ASSOC. PETROLEUM GEOLOGISTS, vol. 20 (1936), No. 6, pp. 797–804.

One of the problems that confront the geologist is the source material for the pool accumulations of petroleum and natural gas. This paper deals with the findings, in Ohio, in limestones, dolomites, and calcareous shales, in a wide section from the Point Pleasant limestone in the Ordovician system to the Delaware limestone in the Devonian. These rocks were carefully sampled and analyzed, the results being representative of the materials throughout the section. Aside from the other components, the analyses give the content of carbon and hydrogen held in the organic paraffin compounds derived from the oily or fatty matter of the original animal life. From these determinations the total amount of natural petroleum per acre for that particular bed is calculated. The thickness of rocks thus covered is 1,160 ft. The results show a wide distribution of such matter and a low total quantity.

The data suggest that source material is present everywhere throughout a great thickness of carbonate rocks; that the content of organic matter approaches closely the general paraffin formula, C_nH_{2n+2}; that the quantity incorporated is commonly not large; and that, in general, more organic matter is present in the dense rocks than in the open-textured ones. The known accumulations appear to be ample to meet any loss of such matter in the associated rocks.

Geophysics

Place of the Vertical Gradient in Gravitational Interpretations.—H. M. Evjen, in GEOPHYSICS, vol. 1 (1936), No. 1, pp. 127–136.

In this paper the author points out the advantages of direct calculation of the vertical derivatives of gravity, or the vertical gradient of gravity, and outlines a system of analysis which, though at first sight appears somewhat elaborate, can be standardized and reduced to routine. The method may require more office work than less comprehensive methods, but the additional time and expense will likely be justified by the more accurate and exhaustive utilization of the data.

Magnetic Prospecting in Santa Catharina, Brazil.—Mark C. Malamphy, in GEOPHYSICS, vol. 1 (1936), No. 1, pp. 23–47.

This field study indicates that the magnetic profile in Santa Catharina is divisible into two parts. The eastern part represents an area of irregular variations in magnetic intensity, while the western part is much more regular. The irregularities are due to shallow or superficial gneisses and granites that make up the crystalline basement and to various igneous intrusions.

On the basis of the data presented it is inferred that structures exist which may be considered as favorable to the accumulation of petroleum, other conditions being assumed to be favorable. The area cannot be considered as distinctly favorable for the production of oil but neither can it be eliminated as unworthy of more detailed study.

Geophysics of the Tomball Oil Field, Harris County, Texas.—J. Brian Eby, in GEOPHYSICS, vol. 1 (1936), No. 1, pp. 148–158.

The Tomball discovery is considered an unqualified geophysical find. So complete was the geophysical picture that the field has the distinction of being the first geophysical prospect to be officially admitted to oil field rank before the discovery well was drilled into sand. The discovery of the field is credited largely to the torsion balance, but the picture was checked both by refraction seismograph and reflection seismograph prior to drilling. The maps given in the paper show how remarkably well the reflection geophysical surveying outlined the structure.

Drilling

Drilling-in Under Pressure.—J. S. Ross, in OIL WEEKLY, vol. 81 (1936), No. 11, pp. 24–28.

The expression "drilling-in under pressure" implies the use of a circulating column of oil and gas having a weight so light in comparison with the formation pressure that the formation pressure may produce oil and gas while drilling is in progress. As applied in the Oklahoma City district this method has several advantages over the older method, in which the circulating column of mud is heavy enough to overbalance the formation pressure which prevents the wel' from coming in prematurely. In the drilling-in method here considered, the flow of oil and gas is always from the formation into the drill hole, starting from the moment the drill penetrates the top of the producing formation and continuing until the well is completed. No mud ever reaches the face of the sand, so that the draining surfaces do not become clogged. By using a mixture of oil and gas there is no loss of circulation, as is apt to be the case with mud, or even with a heavy oi'. By metering the volume of the output gas and gauging the oil as drilling progresses, the capacity of the formation to produce oil and gas can be determined foot by foot, which is not usually possible when the sand face becomes caked with mud.

The operation of drilling-in under pressure requires the use of some form of packing arrangement, between the casing and the drill stem, while the latter is undergoing both vertical and rotary movement. The various arrangements used in the Oklahoma City field for this purpose are described.

Drill Stem Troubles.—K. C. Sclater, in PETROL. ENG., vol. 7 (1936), No. 9, pp. 22–25.

During the extension of oil well drilling into the Capitol area at Oklahoma City, highly

competitive (town lot) conditions seemed to call for extreme haste in reaching the paying formation (Wilcox sand). The result was the prevalence of excessive drill stem trouble, chiefly bending of drill pipe and injury to tool joints. This trouble appears to be the result of excessive rotation speed without corresponding restraint of the weight that is put on the bit, which is a direct cause of twist-offs. It does not seem to be generally realized that there is a definite relation between bit pressure and rotating speed; the use of high speeds without a reduction of pressure leads to trouble.

It is natural to ask, "what is the effective weight to be carried on the bit for a given rotating speed?" Unfortunately, research engineers have not yet prepared tables which the driller might consult for an answer. It is a fact, however, that some contractors employing a pressure of 15 to 25 points (35,000 to 65,000 lbs.) and a rotating speed of 125 r.p.m. have to retire an average of 75 joints of pipe per well, with an average of six fishing jobs, whereas in the same field a well was drilled from the bottom of the surface pipe to the top of the Wilcox sand within an unprecedented short time—27 days—using 7 to 8 points (17,000 to 19,500 lbs.) bit pressure and 100 r.p.m. rotating speed. It is true that high pressure and high rotating speed will make holes fast, *if nothing happens;* what generally happens is that higher drill pipe costs, drill stem failures, and subsequent fishing difficulties are incurred.

Natural Gas

Two-Stage Thylox Process for Hydrogen Sulphide Removal.—A. R. Powell, in GAS AGE-RECORD, vol. 77 (1936), No. 26, pp. 711–715; 720.

The original thylox process for the removal of hydrogen sulphide from gas was based on the use of absorption towers filled with a water solution of sodium arsenite which fixes the H_2S as sodium thioarsenite. This compound readily absorbs oxygen from the air, forming sodium thioarsenite with separation of free sulphur; the thioarsenite is thus regenerated so that it can again absorb H_2S, the cycle being susceptible of indefinite repetition until the solution has to be freed from thiosulphates that are formed in a side reaction.

The difficulty with this original process was that the absorption was not quite complete; to obtain an absolutely "clean" gas the secondary use of iron oxide boxes was advisable. This defect has been remedied by the two-stage thylox process, which is carried out in a tower with upper and lower compartments. The lower compartment, or primary absorber, contains the main body of the arsenite solution where most of the H_2S is absorbed. The gas that has passed through the primary absorber and still contains traces of H_2S is passed into the upper compartment or secondary absorber, which receives make-up solution that is fresh and consequently very active, so that the last traces of H_2S are removed. The operation is continuous; a small stream of fresh reagent flows into the secondary absorber as exhausted solution flows out of the primary absorber on its way to the regenerating tower, where it is blown with air. The sulphur set free in the reaction is collected and may be converted into brimstone. The gas to be treated should be reasonably free from oils and tar.

The process is hardly suitable where the gas to be purified contains very high concentrations of H_2S and is under high pressure. Under such circumstances the phenolate process is usually more economical.

Economy in Natural Gasoline Plant Operation.—W. L. Nelson, in REFINER, vol. 15 (1936), No. 5, pp. 167–172.

In the operation of most natural gasoline plants, the practice is to absorb as large a percentage of the pentane and heavier hydrocarbons as possible. Operation is assumed to be most profitable when the residue gas contains no pentane-plus hydrocarbons. Under certain economic conditions, such as a very high gasoline price or a very low operating cost, the absorption of 99 percent of the pentane-plus hydrocarbons is advantageous, but usually these conditions are such that the absorption of 90 to 98 percent of the available pentane-plus hydrocarbons is a more profitable operation. In some instances even a lower percentage absorption is advisable.

The major reason for stating that all of the heavy hydrocarbons should not be absorbed, is the tremendously larger amount of oil that must be recirculated if 99 percent of the pentanes are to be recovered. As an example, the amount of oil that must be recirculated for different recoveries of pentane are about as follows:

Recovery of Pentane-Plus, Percent of that in Gas	Gallons of Absorption Oil, Based on 5 Gallons for Recovering 60 Percent
60	5
70	6
80	7.25
90	9
95	11
99	16
99.5	18

Thus to increase the recovery from 95 to 99 percent increases the oil recirculation by 50 percent, or to increase the recovery from 60 to 99.5 percent requires that the oil recirculation be increased by about 360 percent.

The source of all profit for the plant is the gasoline that is produced, but the amount of profit depends on certain costs which can easily be evaluated by the simple mathematical formulas presented in this paper.

The East Texas—Baytown Natural Gasoline Line.—Frank H. Love, in PETROL. ENG., vol. 7 (1936), No. 11, pp. 44–46.

The new 300-mile, 8-in. pipeline of the Humble Pipe Line Co. is now in operation for the transportation of natural gasoline, butanes and propane. A part of the project is a polymerization plant at Baytown. Few difficulties were encountered in laying the line through the rolling topography, where the soil was predominately a sandy loam, and for the most part only conventional pipeline practices were required. The line was given a hydrostatic pressure test at 700 lbs. for 12 to 24 hours to make certain of revealing all faulty welds and bad spots in the pipe. Before being put to use the line was cleaned and scraped with water, caustic solution and kerosene. The capacity is 9,000 bbl. a day, which may be increased to 12,500 bbl. by installing an intermediate pumping station at Hearne. The natural gasoline is pumped by two 300 h.p. convertible gas engines driving 8-stage centrifugal pumps; one of these pumps is for regular service, the other is a stand-by. There are two 2,500 bbl. stock tanks; the working pressure is 100 lbs.

Petroleum Refining

Fractionation of Heavy Oils by Solutions of Gas.—S. Pilat, before 3rd World Energy Conference, London, 1936. Paper No. C-11. 7 pp.

When a petroleum residue is dissolved in a light hydro-carbon such as propane and when natural gas or methane is compressed into the mixture, it will be noted that the solubility of the heavy oil varies with the pressure of the gas. At first the heaviest constituents of the residue will be precipitated as a specifically heavier liquid layer. As the quantity of dissolved gas is increased by increasing the pressure, the specific gravity of the heavier liquid phase becomes lighter, and when the pressure has been raised to 130 atmospheres only a small quantity of light oil remains in solution.

These facts have been made the basis of a process for fractionating lubricating oils. The separation of the two liquid phases is accomplished without difficulty in a semi-continuous process which is carried out as follows: The residue is dissolved in propane and subjected to a mild pressure of natural gas in a first tank; the heavy fraction produced here is drawn off, and the solution containing the lighter oils is pumped to a second tank where the gas pressure is increased. After removal of the heavier layer produced in this tank the remainder is passed to a third tank under increased gas pressure, and so on. The number of such stages of increasing pressure is three to five, depending on the nature of the residue and the quality of products it is desired to produce. The final gas pressure in the last tank may be 160 atmospheres. From this highest-pressure tank the remaining solution passes into a second series of tanks where the pressure of the gas is released and the gas is returned to the pressure tanks for treating fresh material. The process is carried out at the ordinary temperature (about 20 deg. C.).

Continuous Acid-Treating of Crude Oils for Production of Motor Oils and Bright Stocks.—George M. Woods, in PETROL. ENG., vol. 7 (1936), No. 11, pp. 38–41.

Experiments were made to compare the method of finishing lubricating oils by the continuous acid-treating crude oil procedure with the usual refining procedure of finishing lubricating oils by batch acid-treating. It was found that the continuous acid-treating of the crude oil offered a ready means of processing lubricating oils and bright stocks at a substantial reduction in chemical and processing costs. In addition, it was found that some residual stocks that could not be used for the production of bright stocks, because of the large amount of asphaltic material they contained, could easily be processed by the crude oil treating procedure.

The oils used in this work were a Mid-Continent paraffin base crude and a paraffin base highly asphaltic crude oil from the Texas Panhandle. These were given acid treat-

Comparison of Conventional Finishing Method and Crude Oil Treating Method for Producing Motor Oils and Bright Stocks

Treating Method	CRUDE OIL METHOD				CONVENTIONAL METHOD			
Crude Source	Mid-Continent		Texas Panhandle		Mid-Continent		Texas Panhandle	
Grade of Oil	Motor Oil	Bright Stock	Motor Oil	Bright Stock	Motor Oil	Bright Stock	Motor Oil	Bright Stock
Yield of Finished Oil, % of Crude[1]	4.69	8.33	6.10	12.74	4.45	6.29	6.55	....
Lb. acid used/bbl. crude	1.00[2]	4.00[2]	1.00[3]	9.00[3]	1.15	4.55	1.70	....
Lb. clay used/bbl. crude	0.21	0.94	0.28	1.84	0.99	2.87	1.47	....
Gravity, deg. A.P.I.	29.2	26.7	30.1	26.3	29.0	25.9	30.3	....
Flash, deg. F.	425	560	435	565	420	555	435	....
Viscosity at 100 deg. F.	406	3250	371	2624	374	3150	383	....
Viscosity at 210 deg. F.	56.2	165.7	55.5	160.3	54.9	162.1	56.1	....
Viscosity Index	84	88	92	99	85	88	91	....
Color, Robinson	9½	1½−	9+	1¼	9¼	1+	8¾−	....
Pour Point, deg. F.	0	5	0	5	0	5	5	....
Carbon, %	0.05	1.64	0.08	1.84	0.04	1.73	0.09	....

[1] Contacting loss assumed to be 7 percent and the dewaxing loss 20 percent of the oil treated.
[2] Total of five lb. used on each barrel of crude.
[3] Total of ten lb. used on each barrel of crude oil.

ments using 98 percent sulphuric acid with a mixing time of three minutes. After removal of the acid sludge and a washing treatment, the crudes were charged to a still along with the theoretical amount of caustic and reduced to the gas oil range by fire and steam, and then under vacuum to a still temperature of 635 deg. F. The overhead lube cuts were then dewaxed by use of a secondary butyl alcohol flux and contacted with Filtrol clay. The inspection and yield data are given in the accompanying table.

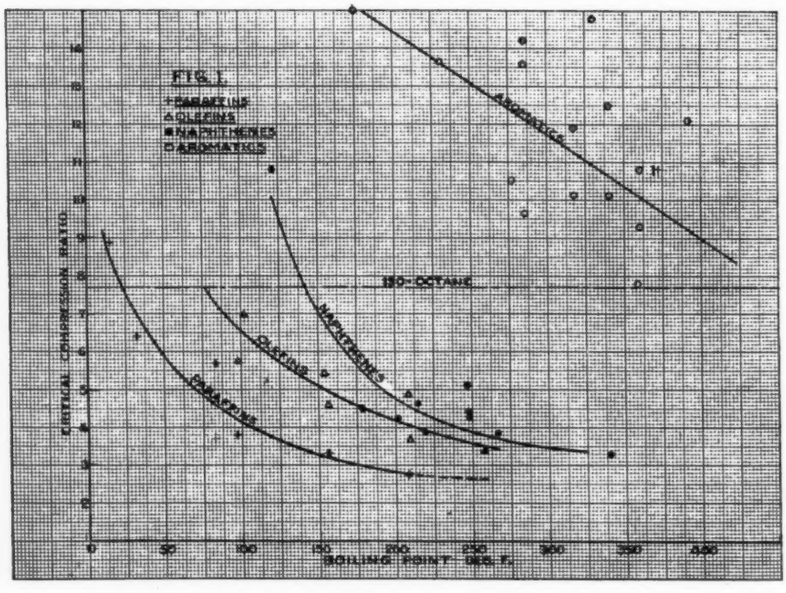
It is evident that there are substantial savings in chemical costs (acid and clay). The greater advantage is that the method can be used to process crudes for bright stocks that are impossible to process by the conventional batch treating method. An even greater possibility is open to those refiners who have continuous treaters for acid-treating cracked naphtha that are no longer used for this service. Such treaters may easily be used for continuous crude oil acid-treating.

FORWARD CRACKING PROCESS MAKES 75 PERCENT OF SUBSTITUTED BENZENES.—Wm. Kaplan and W. E. Forney, in NATL. PETROL. NEWS, vol. 28 (1936), No. 28, pp. 35–42.

One of the main problems of the petroleum industry is the production of a motor fuel that will compare favorably with iso-octane as a standard. A good opportunity of achieving this objective lies in the production of aromatic hydrocarbons; besides being chemically stable (in contrast to the olefines) these hydrocarbons are practically all superior to iso-octane in anti-knock value (see diagram).

Heretofore the principal source of aromatic hydro-carbons has been the coal tar industry, but of late methods have been devised for synthesizing them from petroleum and these methods are now being actively improved. In a process described by the authors a distillate oil, after preheating to above 900 deg. F., was passed through a one-inch cracking coil 2,300 ft. long at a temperature of 1,050 to 1,075 deg. F. under a pressure of 225 lbs. The cracked vapors leaving the top of the chamber were suddenly chilled by means of a water spray and condensed under a pressure of 30 lbs. The accompanying table shows the various aromatics that were identified in the product.

Curves showing the relationship between the anti-knock properties (as shown by critical compression ratio) and the boiling points of the various products, paraffins, olefins, napthenes, and aromatic hydrocarbons discussed in Forward Cracking Process.



Various Aromatics Synthesized From Petroleum

Boiling Range deg. F.	Compound Present
84–168	
168–200	Benzene
200–220	
220–241	Toluene
241–274	
274–290	Xylene
290–315	Isopropyl Benzene
315–320	n-propyl Benzene, O-Methyl Ethyl Benzene, Methyl Isopropyl Benzene
320–325	p-Methyl Ethyl Benzene
325–330	Mesitylene
330–335	Pseudocumene
335–340	Sec. Butyl Benzene, Isobutyl Benzene
340–345	
345–350	o- and p- Methyl Isopropyl Benzene
350–355	
355–360	n-Butyl Benzene, o-Methyl Propyl Benzene
360–370	o- and p-Diethyl Benzene
370–380	
380–390	Iso-amyl Benzene
390–400	n-Amyl Benzene
400–422	Naphthalene
422–450	

Analysis of the crude product showed 4.8 to 8.6 percent of olefines, 85.4 to 91.4 percent of aromatics, 9.8 to 0 percent of napthalenes and no paraffin hydrocarbons. The gasoline cut (410 deg. E.P.) was 51.6 percent, benzene bottoms 5.8 percent, residium (1.2 sq. gr.) 41.7 percent and loss 0.9 percent.

USE OF LIQUID PROPANE FOR DEPARAFFINING, DEASPHALTING AND REFINING OILS.—R. E. Wilson, P. C. Keith and R. E. Haylett, before 3rd World Energy Conference, London, 1936. Paper No. F-8. 43 pp.

As a differential solvent in the refining of crude lubricating oils liquid propane displays some unique properties which distinguish it from other solvents used for this purpose. At temperatures between 100 and 140 deg. F. it dissolves very little asphalt but has a large capacity for dissolving oils and paraffin wax. Within the temperature range 120–212 deg. propane shows its marked difference from other solvents. As the temperature is raised its solvent power becomes less and less; the napthenic compounds are the first to be thrown out, and as the temperature continues to be raised the heavier constituents of the crude oil are deposited until at the critical temperature of propane (212 deg. F.) no viscous oil remains in solution. On the other hand, at low temperatures propane has a small solvent power on paraffin wax. The process of refining a crude lubricating oil with propane therefore takes the following course: the crude lube oil is mixed with three or four times its volume of liquid propane at 120 deg. F. This throws out the asphalt, the paraffin hydrocarbons remaining in solution. After filtering out the asphalt a part of the propane is allowed to evaporate, which chills the solution below—20 deg. F.; this throws out the paraffin wax, which is filtered off. The remaining solution is then warmed up to the ordinary temperature of the surroundings; at this point the solution may be either mixed with other selective solvents or with a small quantity of sulphuric acid to

eliminate napthenes and coloring matters; or, no such additions are made and the solution is simply heated gradually up to 200 deg. F. Under this condition the napthenes are the first to separate. When these are removed and the temperature is further raised, the heavier and then the lighter lube fractions are deposited and the stock may thus be fractionated as closely as desired. Instead of using propane alone it may be used in conjunction with other solvents and other refining agents. Thus the crude lube may be dissolved in propane and given a sulphuric acid treatment; the quantity of acid needed is only a fifth of that ordinarily required. Or the stock may be dissolved in propane and treated with decolorizing clay. In this manner the efficiency of the clay treatment may be increased as much as 400 percent.

There are now in operation several deparaffining plants using propane, and within the past two years seven plants have been installed to use propane in a two-solvent (Duosol) system.

Petroleum Chemistry

Desulphurization of Hydrocarbons with Carbon Monoxide.—Boris W. Malishev, in JOUR. INST. PETROLEUM TECHNOLOGISTS, vol. 22 (1936), No. 151, pp. 341–346.

This work was undertaken with the object of studying the desulphurization of hydrocarbons with carbon monoxide in presence of catalysts. This method is analogous to desulphurization by hydrogenation, and would be operative with some of the catalysts used in the latter process. The sulphur would be removed as carbon oxy-sulphide (COS) similarly to removal of sulphur as H_2S in hydrogenation.

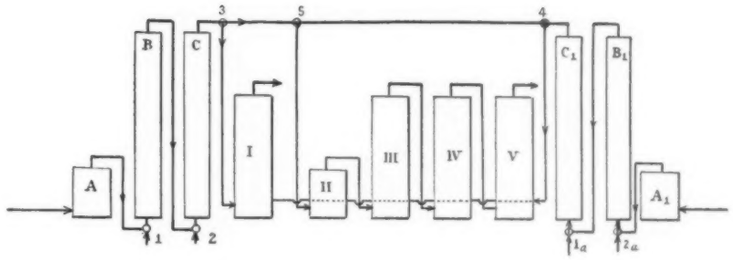
It has been shown on a solution of thiophene in toluene, which analyzed in average 0.85 percent sulphur, that sulphur can be eliminated, leaving about 0.05 percent when treating for 4 hours with CO under an initial gas pressure of 1,000 lb. in a closed autoclave at 300 deg. C. with MoS_3 as catalyst. Other catalysts are active, but their efficiency is not known. Under same conditions of experiment a pressure distillate with a boiling range of 175–200 deg. C., which mainly contained the most stable tetramethyl-thiophene, was reduced in sulphur from 0.95 percent to 0.27 percent. The dried MoS_3 catalyst is not always equally effective. It appears that small amounts of moisture or H_2S are required to activate the carbon monoxide. This point has to be proven by further experiments.

A vapor-phase treatment of a solution of thiophene in toluene, with CO at atmospheric pressure at 300 deg. C. over MoS_3, showed a reduction of sulphur from 0.60 percent to 0.32 percent.

Chemical Transformation of the Components of Cracked Gases.—R. Fussteig, in ACTUALITIE CHIM. IND., vol. 35 (1936), No. 5, pp. T. 162–T. 167.

The residual gases from a petroleum cracking still contain nearly 50 percent of olefines, principally ethylene, propylene, butylene and butadiene. These olefines can be converted into the corresponding alcohols and numerous patents have been taken on processes for accomplishing the purpose, most of these processes being based on the use of diluted sulphuric acid with or without catalyzers.

The author has elaborated a commercial process which is schematically represented in the accompanying diagram. The gas is first passed through the dehydrating tower A, filled with calcium chloride and then through tower B, which is filled with small fragments of quartz. It next enters tower C, which is filled with an activated carbon and is provided with a bundle of steam tubes by which the carbon may be heated to a constant temperature of about 40 deg. C. The carbon absorbs the higher olefines while the saturated hydrocarbons and ethylene pass on. The gas then goes into tower I, where the ethylene is absorbed, and the residual gas is collected in a gasometer. Whenever the gas issuing from C is found to contain olefines other than ethylene, towers B and C are shut off and communication is established with a second battery A_1, B_1 and C_1 where the same operations are carried on while the olefines absorbed by the carbon are being expelled by steam; the mixture of steam and gas thus produced passes into the vessel II containing sulphuric acid of 45 deg. Be., with one percent of silver nitrate and 0.3 percent of copper chloride as catalyzers. Here the butadiene is retained; the gas then goes through vessels III, IV and V, containing sulphuric acid of increasing concentrations, whereby the various higher alcohols are obtained separately. After regenerating the carbon with superheated steam the cycle is repeated; ethyl alcohol is obtained from the ethylene not absorbed by the carbon.



Polymerization of Ethylene with Phosphorus Pentoxide.—Boris M. Malishev, in PETROLEUM, vol. 32 (1936), No. 19, pp. 1–3.

Phosphorus pentoxide polymerizes ethylene to a liquid mixture of paraffinic, napthenic and aromatic hydrocarbons. The product has a boiling range of 20 to 205 deg. C. and an octane number of 81.5. As a polymerizing agent phosphoric pentoxide is much more active than phosphoric acid; as a catalyzer it is fairly comparable with aluminium chloride; it does not attack metal, and in this respect has an advantage over aluminium chloride.

Propylene Polymerization.—O. L. Brandes, W. A. Gruse and Alexander Lowy, in IND. ENG. CHEM., vol. 28 (1936), No. 5, pp. 554–559.

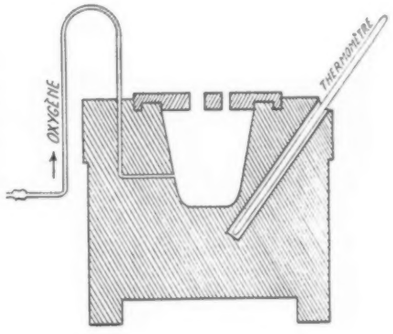
This paper presents the results obtained in a study of the polymerization of propylene at elevated temperatures and pressures in the presence of zinc chloride as catalyst. Experiments were conducted in a closed pressure apparatus under three different conditions of temperature, pressure, and time. Liquid polymer yields as high as 74.2, 43.5, and 64.4 percent by weight were obtained under the three respective conditions. A total of 74.5 percent by volume of the 290–310 deg. C. product, 85.9 percent of the 200–210 deg. C. product, and 92 percent of the 150–160 deg. C. product distilled in the motor gasoline range (to 200 deg. C.).

Petroleum Physics

Correlation Between Point of Spontaneous Ignition and Anti-Knock Quality of Motor Fuels.—I. R. Roseanu, in MONITEUR PETROLE ROUMAINE, vol. 37 (1936), No. 13, pp. 1021–1023.

The point of spontaneous ignition of a mixture of air or oxygen and hydrocarbon vapors is defined as the temperature at which the mixture explodes by itself without the aid of a spark. This point has nothing to do with the ordinary flash or fire test that is applied in the routine examination of lamp oils, for example. The spontaneous ignition point is a chemical constant, determined by the molecular constitution of the motor fuel. The simpler the molecular constitution, the higher the spontaneous ignition point; a simple mixture of hydrogen and oxygen has a very high explosion point, 480 deg. C.

In executing the research recorded in this paper, the author made use of an apparatus shown diagrammatically in the accompanying figure. It consists of a steel block in which is



placed a platinum crucible and a cover which can be made air-tight; a channel is provided for introduction of oxygen.

The block may be heated to known temperatures, as shown by a thermometer. The explosion point is determined either by noting the minimum temperature at which the previ-

ously prepared mixtures exploded, or the temperature at which explosion occurs one second after a drop of the hydrocarbon has been introduced into the explosion chamber. Oxygen is introduced under a known pressure, for instance 25 atm. With this apparatus, data were secured as shown in the accompanying table.

Explosion Temperatures of Petroleum Products

Fuel	Minimum	After 1 second	Octanes
Residue	254° C.	284° C.	
Diesel oil	255° C.	285° C.	
Gas Oil plus 5° C.	256° C.	286° C.	
Gas Oil minus 5° C.	258° C.	292° C.	
Gas Oil minus 15° C.	265° C.	302° C.	
Pipeline oil	167° C.	303° C.	
White Spirit	272° C.	310° C.	
Touring gasoline	279° C.	312° C.	58
Cracked gasoline	282° C.	315° C.	58.5
Light gasoline	285° C.	320° C.	61
Light gasoline	287° C.	324° C.	63
Light gasoline	290° C.	326° C.	67
Light gasoline	292° C.	327° C.	69
Light gasoline	294° C.	328° C.	72
Light gasoline	296° C.	330° C.	74
Light gasoline	298° C.	332° C.	75
Light gasoline	302° C.	336° C.	78
Mixtures with Benzene			
Aviation gasoline	298° C.	330° C.	74
Aviation gasoline 5% benzene	300° C.	332° C.	76
Aviation gasoline 10% benzene	303° C.	335° C.	78
Aviation gasoline 15% benzene	304° C.	336° C.	80
Aviation gasoline 20% benzene	308° C.	340° C.	82
Aviation gasoline 30% benzene	310° C.	345° C.	84
Aviation gasoline 40% benzene	312° C.	345° C.	86
Aviation gasoline 60% benzene	315° C.	350° C.	86.5

These data demonstrate the correlation between the point of spontaneous ignition of a hydrocarbon and its octane number, both being chemical properties closely related to the molecular constitution of the fuel. On the basis of other "innumerable" experiments made by him, the author concludes that a determination of the spontaneous ignition point will give the anti-knock value of a fuel, which otherwise has to be ascertained by a difficult and costly operation.

Compressibility of Butane-air Mixtures Below One Atmosphere.—F. W. Jessen and J. H. Lightfoot, in IND. ENG. CHEM., vol. 28 (1936), No. 7, pp. 870–871.

The compressibility of *n*-butane-air mixtures and of *n*-butane was determined at 30 deg. C. It is shown that the additive rule for determining the compressibility of gas mixtures at low pressure does not hold for butane and air, the maximum deviation being 23 percent. The variation of the compressibility coefficient of *n*-butane with temperature is presented.

Effect of Entrainment on Plate Efficiency in Distillation.—Allan P. Colburn, in IND. ENG. CHEM., vol. 28 (1936), No. 5, pp. 526–530.

The effect of entrainment in a plate column used for distillation or absorption is to reduce the apparent plate efficiency. This efficiency, E_a, can be calculated by the approximate equation:

$$E_a = \frac{E_v}{1 + \frac{eE_v}{R}}$$

Employing this equation, a relation is developed for the amount of entrainment occurring when the column is operated at the optimum vapor velocity (assuming that the entrainment increases with the fourth power of the velocity): e (at optimum velocity) $= R/3E_v$. Since this value is so high, the importance of large enough down pipes for liquor and of low back pressure through chimneys and caps is emphasized.

Micro-Vaporimetric Determination of Molecular Weight.—Joseph B. Mederl, Otto R. Trautz and Albert A. Plentl, in IND. ENG., CHEM., analyt. ed., vol. 8 (1936), No. 4, pp. 252–255.

A previously described micromethod for determining vapor density of low-boiling liquids has been suitably modified to include high-boiling liquid and solid substances of various types. The results obtained compare favorably with any of the existing macro- or micromethods based upon similar principles. The method, in addition to the determination of the molecular weight, permits repetition as well as simultaneous observation of the boiling and condensing point on a single sample of a few milligrams in weight.

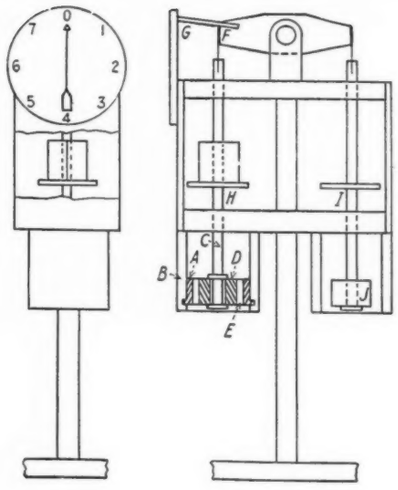
Asphalt and Tar

Rapid Method of Measuring High Viscosity.—R. N. Traxler and H. E. Schweyer, before Am. Soc. Testing Materials, Atlantic City, 1936.

Although various methods exist for fairly accurate measurement of the viscosities of asphalts, bitumens, etc., there has been a lack of a control instrument for use where results are required in the shortest possible time.

A viscosimeter answering this requirement has been developed in the Research Bureau of the Barber Asphalt Co., and is shown diagrammatically in the accompanying figure.

The brass outer cylinder *A* is held in a bakelite holder *B* by means of an arrangement which makes possible rapid insertion or removal of the mold. A bakelite rod *C* passes



through the inner cylinder *D*. The material under test fills the annulus *E*. The bakelite rod *C* is connected to a metal ribbon which passes over a rocker arm *F* which in turn is attached to another rod *I* and a counterpoise *J*. A weight *H* applied to rod *C* causes the inner cylinder *D* of the viscosimeter to move downward; added to rod *I* it causes cylinder *D* to move upward. In order to measure a wide range of viscosities the apparatus is equipped with several weights that may be applied to cause either an upward or a downward movement of the inner cylinder. To protect the weights from corrosion and damage, the entire mechanism is enclosed. The distance of movement of the inner cylinder for a given time is indicated on dial *G*. From the rate of movement under a given load, the viscosity can be calculated directly. A thermostatically controlled bath surrounds the coaxial cylinders and holder *B*. Rod *C* and holder *B* are made of a non-metallic material in order to eliminate the conduction of heat away from the sample.

The apparatus will measure viscosity in 10 to 100 seconds over a range from 5,000 to 1,000,000,000 poises. Further experiments may prove that these limits can be extended. On account of its speed and simplicity, this viscosimeter should be useful to the technologist interested in the flow properties of highly viscous materials, such as natural and synthetic resins, tars and asphalts.

Compression Testing of Asphalt Mixtures.—Roland Vokac, before Am. Soc. Testing Materials, Atlantic City, June–July, 1936; Paper No. 89.

Heretofore it was not considered feasible to test asphalt paving mixtures by the ordinary methods of compression testing. This paper presents information to show the utility of such ordinary compression testing methods in this field. On the basis of data presented such fundamental characteristics as modulus of elasticity in compression, compressive strength, and elastic limit may be readily evaluated. It is indicated that these physical characteristics may be interpreted in their usual sense by the engineer for the purpose of specification and design.

Two methods of testing have been studied: (1) applying loads for a uniform rate of de-

formation, and (2) applying a uniform rate of increase of load on a specimen. The former method is found the most practical, and 0.05 in. per min. has been used most successfully. In the ordinary testing procedure decided upon in this work a study of the effects of temperature indicate that room temperatures, about 78 deg. F., are suitable and slight variations do not greatly affect the data.

The effect of diameter and height of test specimens has been studied and as a result it has been found necessary to limit the height to not less than three-fourths the diameter. This is because of an "end effect" on the modulus of elasticity when shorter specimens are used. The effect of compression as measured in the density of a given mixture is also considered. With such treatment of the data it is indicated, for instance, that the stress characteristics of samples with miscellaneous heights and densities as obtained in coring a pavement surface, may be evaluated on a strictly comparable basis.

Equipment necessary for suitable use of the testing methods described may be any compression or universal type testing machine. It is necessary only that the machine will operate to give a fairly constant rate of deformation and can be so operated as to produce stress-strain diagrams by any of the ordinary means.

HETEROGENEITY OF ASPHALT.—A Quantitative Method.—G. L. Oliensis, before Am. Soc. Testing Materials, Atlantic City, June–July, 1936; Paper No. 85.

This paper comprises a further discussion of the significance of the spot test, which test was first described before the Society by the author in 1933. Several additional causes of heterogeneity are explained, other than high temperatures. The effectiveness of certain homogeneous asphalts in "correcting" heterogeneity is discussed. A method of determining heterogeneity quantitatively is presented, the procedure being the same as in the qualitative determination, except that instead of straight naphtha, mixtures of naphtha and xylene are used, the minimum proportion of xylene necessary to yield a negative "spot" determining the degree of heterogeneity quantitatively.

INCREASE OF VISCOSITY OF ASPHALTS WITH TIME.—R. N. Traxler and H. E. Schweyer, before Am. Soc. Testing Materials, Atlantic City, June–July, 1936; Paper No. 88.

When asphalts were maintained undisturbed at 25 deg. C. (77 deg. F.) the viscosities were found to increase with time. This aging phenomenon has been studied by means of the falling coaxial cylinder viscosimeter for a number of asphalts of various origins and methods of processing.

Eight to eleven viscosimeters were loaded with the asphalt to be investigated and placed in a cabinet maintained at 25 deg. C. (77 deg. F.). As soon as the samples had cooled to this temperature (3 to 4 hr.) one instrument was removed and the viscosity determined at 25 deg. C. (77 deg. F.). The remaining samples were removed at increasing intervals of time and the viscosities measured.

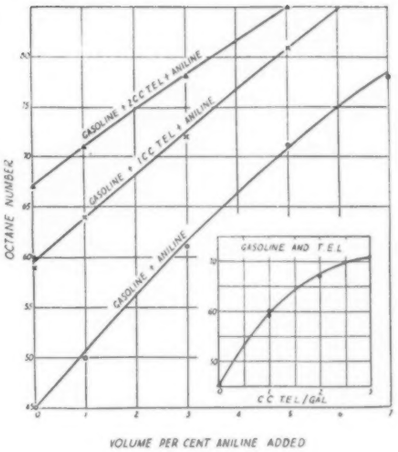
From the data obtained it is evident that certain asphalts age-harden more rapidly and extensively than others, and that the phenomenon in air-blown asphalt is different than in steam- or vacuum-refined materials. Adding mineral powder to an asphalt has very little effect on the rate of age-hardening. An Asphalt Aging Index is proposed which quantitatively evaluates the rate of increase of viscosity with time. Development of a thermally unstable structure within the asphalt is probably the cause of the age-hardening phenomenon.

Reheating a time-hardened sample *in situ* returned the asphalt to its original viscosity provided too long a time had not elapsed. However, if a sample was aged for several thousand hours, permanent changes (due to volatilization, etc.) also occurred in the asphalt and reheating the sample did not eliminate all of the viscosity developed during aging.

The Asphalt Aging Index here proposed is represented by

$$A.A.I. = M$$

where M is the slope of the log-viscosity *versus* log-time curve.


OCTANE NUMBER
GASOLINE + 1 CC TEL + ANILINE
GASOLINE + 1 CC TEL + ANILINE
GASOLINE + ANILINE
GASOLINE AND T.E.L.
CC TEL / GAL
VOLUME PER CENT ANILINE ADDED

Petroleum Uses

A NEW HIGH-OCTANE BLENDING AGENT.—H. E. Buc and E. E. Aldrin, before Soc. Automotive Engrs., White Sulphur Springs, 1936; Nat. Petrol. News, No. 25 (1936).

Technical iso-octane is now used on a commercial scale as a base stock to which tetraethyl lead can be added to produce a high anti-knock value in gasolines. More recently the petroleum industry has succeeded in providing a new material to supplement technical iso-octane. This new material is iso-propyl ether, which apparently meets the requirement of present day military and commercial fuel specifications when blended with aviation gasoline in proportions to give 100 octane number (O.N.) with 3 cc. of tetraethyl lead. A 100 O.N. gasoline made by blending with iso-propyl has somewhat lower fuel efficiency than regular 92 O.N. gasoline under cruising conditions, but this may be overcome by going above 100 octane, which is possible with this material. As regards supplies, it is estimated that the American petroleum industry is in a position to furnish 340,000,000 gallons of technical iso-propyl ether a year. With large-scale production the cost is entirely reasonable.

SUSCEPTIBILITY OF GASOLINES TO T.E.L. AND ANILINE.—C. O. Tongberg, D. Quiggle, E. M. Fry and M. R. Fenske, in IND. ENG. CHEM., vol. 28 (1936), No. 7, pp. 792–794.

Although aniline has been known as a good anti-knock material for some time, it is not being used today commercially as an anti-knock. Nevertheless, it has properties that other anti-knocks do not have. The addition of aniline up to seven volume percent gives practically a linear increase in octane number for straight-run gasolines, whereas tetraethyl lead, for example, gives only small increases in octane number when over 2–3 cc. are used. In cracked gasoline aniline gives a greater increase in octane number for the first two percent than it does for the second two percent, but from two to seven percent the increase is again practically linear. This property of aniline points to the possibility that it might supplement the action of tetraethyl lead by acting independently of it. In the accompanying figure the effect of adding aniline to a straight-run gasoline and to the same gasoline containing 1 cc. of tetraethyl lead per gallon is shown. The slopes of the aniline-gasoline and aniline-tetraethyl lead-gasoline curves are about the same. In other words, the tetraethyl lead and the aniline are acting independently of one another.

Certain cracked gasolines behave similarly and can be easily brought up to 80 octane number or higher by the use of aniline and tetraethyl lead together, whereas the use of tetraethyl lead alone would fail to accomplish this result.

Petroleum Substitutes

THE POTT-BROCHE PROCESS.—M. Friedwald, in REV. PETROLIFERE, No. 690 (1936), pp. 967–968.

The problem of manufacturing synthetic motor fuels has reached the stage at which the product can be delivered at a price that does not entail too great a sacrifice, where political and economic conditions such as those existing today in Germany, for example, are involved. This solution of the problem has been relatively satisfactory as regards the light motor fuels (gasoline) but not so satisfactory as regards substitutes for gas oils adapted for use in Diesel engines. The tarry products obtained in the hydrogenation of coal and in the manufacture of petroleum from water-gas (hydrogen and carbon monoxide) do fairly well for low-speed, but not for high-speed Diesels. This has been regarded as the one technological failure of modern petroleum synthesis from coal. This defect now appears to be on the way to correction by the Pott-Broche process, which was developed in the laboratories of the Mathias Stinnes group and, according to a recent announcement, has been taken over by the I. G. Farbenindustrie.

Not much has been published regarding this process but it is known to depend on solvent extraction of the coal with a mixture of tetraline, phenol, and napthalene under pressure at a temperature slightly under the point where the coal would begin to decompose when subjected to dry distillation (380 to 410 deg. C.). The extraction is carried out in three or four

successive stages until more than 80 percent of the coal has passed into solution. After separation of the solvent the residue, which has a relatively low ignition point (270 deg. C.), can be used in Diesel engines or hydrogenated under pressure with a molybdenum catalyzer to produce a whole series of petroleum products. The extract presents a considerable advantage over coal for hydrogenation in that it is practically free from ash and other products that are difficult to hydrogenize. A particular advantage is that the extract can be blended with a considerable proportion of tar oils for Diesel purposes, thus opening a wider field for the use of these tar oils. Another advantage of the Pott-Broche process is that it involves less hydrogenizing and is more of a depolymerizing process; the cost of producing hydrogen, which is one of the most expensive items of ordinary coal hydrogenation, is thus largely obviated.

COAL HYDROGENATION IN HUNGARY.—Oskar Tokayer, in PETROLEUM PRESS SERVICE, vol. 3 (1936), No. 29, pp. 228–229.

Following the example of other countries, the Hungarian Government has conceived the idea of establishing an industry for the production of synthetic gasoline from coal. As in countries equally deficient in domestic oil reserves, the main object in view is to make provision for national defense by supplying part of the national oil requirements from indigenous raw material. It is also hoped, however, by this means to provide an outlet for certain qualities of Hungarian lignite for which it is difficult to find a market.

For some years experiments in the hydrogenation of coal in Hungary have been in progress according to the method elaborated by Prof. J. Varga, which, however, is limited to the hydrogenation of coal tar, not solid coal or lignite; to produce sufficient coal tar for a supply of synthetic petroleum would mean the production of more coal gas and coke than could be disposed of in Hungary. A commission has been appointed to look into the methods of hydrogenating raw lignite and bituminous coals as practiced in Germany and Great Britain.

POWER ALCOHOL DEVELOPMENT IN QUEENSLAND.—M. R. U. Nathan, in OIL NEWS, vol. 40 (1936), No. 1233, p. 26.

Under the Motor Spirit Vendor's Acts the government of the State of Queensland (Australia) requires all wholesale marketers of gasoline to purchase a quantity of power alcohol based on a percentage of their total sales. The result is that all oil companies in Queensland are marketing a gasoline-alcohol blend containing approximately 15 percent alcohol at a price ½d below standard gasoline grades.

Note.—This matter of putting an alcohol-gasoline blend on the market at a price less than straight gasoline may at first sight appear to be something new under the sun. Under ordinary circumstances the cost of manufacturing alcohol is so high that free competition between the two fuels is out of the question on even an equal price basis. But the situation in Queensland is as follows: the principal industry of that state is the manufacture of cane-sugar. A by-product of this industry is molasses, which heretofore has been mostly thrown away; now it is turned over to alcohol manufacturers at a nominal price for conversion into motor fuel. Naturally, with a raw material that costs next to nothing it becomes possible for alcohol to compete with gasoline, especially in a country without an oil industry of its own and where imported gasoline bears taxation from which alcohol is exempt.—Ed.

Petroleum Economics

FIVE YEAR FINANCIAL RECORDS.—Henry E. Rose, in WORLD PETROLEUM, vol. 7 (1936), No. 7, pp. 351–354.

The financial records of 23 American and 8 foreign oil companies during the period 1931–35, inclusive, are presented and analyzed. In this period 1935 was a good year for many companies; each of the 23 American companies was able to show something in the way of net earnings; combined their net earnings were a little over $275,000,000, but the average per share of common stock was only $1.50.

The improvement in the position of the oil companies is due to improvement in general business conditions and to factors within the industry. Among these is the more effective application of proration, the prevalence of more stable marketing conditions and refunding operations by which advantage has been taken of current low rates of interest. Interest on oil company bonds is now as low as 3½ percent. Many companies have strengthened their positions by additions to reserves, but what effect the new American tax law penalizing surplus accumulations will have is still problematical.

Oil companies outside the United States show the same general improvement in net operating results, but these companies have not experienced the same fluctuations in earnings, due to the fact that foreign consumption of petroleum products increased continuously during the depression, while in the United States there was a falling off in the demand.

ECONOMIC AND FISCAL PROBLEMS RAISED BY SOLID MOTOR FUEL SUBSTITUTES.—Charles Berthelot, in ACTUALITIE CHIM. IND., vol. 35 (1936), No. 6, pp. 1465–1467.

The growing use of "gasogene" trucks in Europe raises some important questions of economics and national revenue. There is now no question of the practicability of operating automotive vehicles powered by gas generated from anthracite or semi-coke (which are regarded as the best combustibles for the operation of these gasogenes). In a test of military trucks in the presence of Marshal Petain in February, 1936, a convoy, with all tanks empty and engines cold, was supplied with wood charcoal and started on the road within four minutes, which compares favorably with what can be done with gasoline; government passenger buses with gasogene outfits are now transporting 100 passengers at a speed of 100 kilometers (66 miles) an hour; commercial gasogene trucks easily negotiate long steep grades at 20 miles an hour.

Behind this demonstrated utility of "forest gas" as a motor fuel there rises the question of supply. The annual supply of waste wood in France for the manufacture of charcoal will serve to substitute for about 95,000,000 gallons (2,260,000 bbl.) of good gasoline. In case of need this may be supplemented by anthracite and semi-coke as previously referred to. Altogether, the gasogene offers a means of stretching limited national supplies of petroleum and also a means of reducing payments for foreign motor fuels. For these reasons Germany, which has expended much effort in creating a synthetic petroleum industry on the basis of her coal resources, is also expending no little effort in the development of automotive vehicles employing solid fuels of native origin. Both France and Germany are backing the gasogene in spite of the fact that each new vehicle of this type means a loss of revenue from gasoline taxation.

On the basis of road experience in France, the author presents the accompanying table showing the cost of a ton-kilometer for a 7½ ton truck powered by: (I) a gasoline motor, (II) and (III) Diesel engines, and (IV) a gasogene motor operating with wood.

Type of engine	Cost of ton-kilometer Francs
I	0.343
II	0.250
III	0.266
IV	0.234

These figures include wages and overhead and are figured on pay loads for the round trip. The relatively low cost per ton-kilometer of the gasogene motor is explained by the fact that the gasogene truck pays none of the taxes that are assessed against trucks designed for petroleum fuels, and that wood is also tax-free.

FACTORS IN GASOLINE PRICES.—Oskar Tokayer, in PETROLEUM PRESS SERVICE, vol. 3 (1936), No. 17, pp. 129–131.

The cost of motor fuel has become today a matter of vital public interest. Not only does it influence the development of motor traffic generally but it forms an important part of the transport costs of many commodities and so has a considerable effect on the prices at which they are eventually sold.

Interested as the public is in this question, it has, however, rarely any understanding of the factors which enter into the fixing of the retail price of gasoline. The average consumer of gasoline, if he stops at all to consider the reasons for a change in gasoline prices, generally attributes the result to an arbitrary decision on the part of the large distributing firms. That such price movements are in fact chiefly dependent on factors outside the control of individual companies or groups of companies, the consumer is usually quite unaware.

Of special interest, therefore, is the recently published report of the investigation which the South African Government began about a year ago into conditions in the domestic gasoline market.

Commenting on the fact that expenditure on gasoline remains a very important item in the national economy, in spite of the decrease amounting to 80 percent during the past 10 years in the f.o.b. price, the Board shows that, out of the total expenditure on this commodity during 1935 amounting to £8,000,000, only £1,800,000, or 22.5 percent, left the country in the form of f.o.b. cost, insurance, freight and profits of the importing companies. The Government and the South African State Railways together received exactly twice as much (£3,600,000) or 45 percent. The remaining 32.5 percent was represented by the cost of wholesale and retail distribution, which incidentally give employment to about 5,000

Europeans and the same number of non-Europeans. From the point of view of purchasing power distributed, the oil companies rank ahead of such important industries as clothing and furniture manufacturing and actually circulate a larger proportion of their total income in the Union than either of these industries. "There are not many industries apart from gold mining," the report says, "which contribute more of the earnings of the community than the gasoline distributing services."

The above shows that the price of the gasoline itself is not more than 20 percent of the wholesale cost, while duty and railway freight account for over 57 percent. As to the suggestion that the marketing costs of the oil companies are too high, the report shows that between 1930 and 1934 these costs were reduced by 2.9d. per gallon, or nearly 40 percent. As regards the possibility of further reducing these costs, the Board takes the view that "cooperation rather than competition appears to offer the greatest scope for further economies in the marketing of gasoline."

Books

THE SPANISH PETROLEUM MONOPOLY (LE MONOPOLE DU PETROLE EN ESPAGNE).—By Jacques Grandel, published (1935) by Librairie Technique et Economique, Paris. 197 pages (in French).

In this book the author sets before himself the task of studying the origin of the Spanish oil monopoly and how it has functioned in its economic and fiscal aspects, and he manages to write a very interesting and instructive story. The motive that prompted the establishment of this monopoly is very clearly brought out: It was purely and simply a desire on the part of the finance minister of the time to appropriate for the government the huge profits that the two great foreign oil trusts—the Shell and the Standard—were thought to be taking out of the country. How this idea was carried out, and the consequences thereof are described with admirable clarity. Here we see how a national oil monopoly works, or at least how a Spanish oil monopoly works. The author is, for the most part, eminently objective and impartial, but he takes occasion to compare the Spanish system with the French system, in which strict control of the oil industry in the national interest is not inconsistent with a wide margin for private initiative in the service of the public. It may be that there are, somewhere, statesmen wise enough to design a government oil monopoly that might function better than the system of free competition, but the author makes it clear that the Spanish monopoly is not the product of a high order of economic or social wisdom.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, VOL. 118.—Petroleum Development and Technology. Published 1936 by the Institute, New York. 536 pp. $5.00.

This annual volume contains the papers and production statistics presented at the Fall meeting (1935) held in Houston and the annual meeting (1936) in New York; it is the eleventh of the Petroleum Development and Technology series of the Petroleum Division A.I.M.E. There are 20 papers grouped in four chapters: Estimation of Petroleum Reserves, Production Engineering, Petroleum Economics. There is also a chapter on Refining.

The chapter on production engineering covers 139 pages with 14 papers on such subjects as vertical flow of gas-liquid mixtures, structure of clay gels, surface tension and specific gravity of crude oil under reservoir conditions, methods of determining sucker rod loads, acid treatment of oil sands, oil recovery from sandstones by gas drive, water flooding in the Mid-Continent, chemical methods of shutting off water in gas and oil wells, plug-back cementing methods. Papers presented but published elsewhere include: applications of insoluble residue methods to oil exploitation problems, salt water problems, casing perforation by gunfire, Kettleman Hills subsurface survey, and futuristic methods of oil field development and production. The chapter on petroleum economics has five papers covering 20 pages. The chapter on production has 229 pages devoted to the 29 producing fields of the United States, each of which is reviewed by one or more specialists, and 76 pages devoted to 19 foreign countries. The chapter on refining is a review of engineering progress during 1935 by Walter Miller, and covers 6 pages.

The appearance of this annual compendium is always an event to be looked forward to and, as usual, the papers here gathered together afford practical answers to many problems confronting the oil-producing industry today.

OIL-BEARING ROCKS OF BRAZIL.—By S. Froes Abreu, published (1936) by Instituto Nacional de Technologica, Rio de Janeiro. 159 pages.

In this book there is assembled the known authentic data that have been scattered in fragmentary form through many publications relating to oil bearing rocks in Brazil, and the author has added information gathered by himself. At that, there is not a great deal to offer. Deposits of liquid petroleum of any appreciable extent are not yet known to exist in Brazil, and there does not appear to be much prospect that such deposits will be found; most of Brazil is underlain by an Archaean basement with a thin veneer of tertiary and other late rocks formed under conditions that have not given rise to crude oil accumulations. Oil occurs abundantly in nearly all other South American countries—Argentina, Peru, Bolivia, Ecuador, Colombia, Venezuela—but here nature has provided the requisite conditions; extensive marine deposits that have been shaped into oil-holding structures by the orogenic movements that produced the Andean cordillera.

Such hopes as Brazil can entertain of an indigenous petroleum industry must therefore continue to be pinned on her oil-bearing shales, and even here the prospects are slim. The best known of these shales are those of Marahu (Tremembe), where borings disclose 9 oil-shale horizons totaling 32 meters of thickness in a section of 387 meters. Other less known deposits occur at Taubate and Iraty, but aside from the fact that on distillation these shales may yield up to about 25 percent of a crude oil there is no information tending to show the importance of these deposits in terms of "oil reserves."

However, the author concludes that if the government will grant to private capitalists exemption from all tariff duties on imported machinery for working the schists, greatly reduced railway freight rates on the products, and, last but not least, if the government will use its powers to see that the products find a place in the markets, then private capital might be induced to erect one or more plants with a total capacity for working 17,000 tons of five percent schist a day to produce the equivalent of the 250,000 tons of gasoline annually consumed in Brazil.

PETROLEUM (ERDOEL).—By K. Krejci-Graf, published (1936) by Verlag Julius Springer, Berlin. 164 pages. 4.80 RM.

This book (in German) has been written with a feeling that many, if not most, of the persons engaged in the petroleum industry have only a meager acquaintance with the facts regarding the origin of crude oil and the conditions under which it is most likely to be found. The author has therefore collected all the pertinent facts of limnology (oceanology), hydrobiology, geochemistry and geology that have bearings on the origin, migration, accumulation, discovery and exploitation of that invaluable substance on which our "gasoline civilization" is founded, and has written them up in a form that is not too difficult of comprehension by the ordinary man. This reviewer believes that there is much room for books of this type if written in English.

LE PETROLE ET SON ECONOMIE (PETROLEUM AND ITS ECONOMICS).—Published (1936) by Librairie Technique et Economique (Williams and Norgate, London). 221 pp. double column. 10s. 6d.

This book comprises 23 chapters on various phases of petroleum economics in different countries, each written by an authority. There is a preface by Louis Pineau, Chief of the French Oil Administration. The characteristics of the world petroleum market are described by Henry Peyret, who also contributes the chapters on Petroleum in the Far East (Japan, Manchoukuo, China), the German oil market, the Russian oil market, and a chapter on France and oil. "Technical ideas" are written up by Robert Courau; this is largely a brief statement of current practices. Crude oil and its deposits are discussed by Charles Bihoreau, the refining industry by G. Emakoff. There is a chapter on finished products, their commerce and consumption by J. Filhoe, a chapter on the world oil-tanker fleet by Raymond-Ch. Julien, one on the means of transporting petroleum by L. Chove. The great petroleum trusts and government oil enterprises are discussed by J. Filhol, the evolution of the United States market and the Roosevelt Code by Louis de Miramon-Pesteils, the British petroleum market by Cecil W. Wood, the Roumanian oil market by Mihail Pizanti, the Italian oil situation by Giulio Bosco, the Spanish oil market by Jose-Antonio Alvarez, Irak and the Compagnie Francaise des Petroles by Maurice Mercier. Jean Hamel contributes a chapter on petroleum and the tax-gatherer, which is a review of current systems of oil taxation. Petroleum and the capital market are treated by Roger Cadot, petroleum and technological standardization by H. Weiss, petroleum and commercial standardization by a contributor who signs himself XXX. The final chapter is on the future of petroleum by R. Brunschweig.

To those who read French this volume will present an informing if rather summary survey of selected phases of the world petroleum industry.

World Oil Production—Official Figures for 1935 and 1936 Revised

All figures furnished direct to WORLD PETROLEUM by Governments, except where otherwise specified

(Figures in U. S. Barrels—Conversion ratio 7 bbl.=1 ton)

Country	August 1935	September 1935	October 1935	November 1935	December 1935	January 1936	February 1936	March 1936	April 1936	May 1936	June 1936	Provisional Figures July 1936
United States	84,816,000	84,109,000	88,160,000	86,475,000	88,711,000	88,820,000	82,120,000	90,568,000	90,479,000	93,739,000	90,185,000	91,466,200
Russia	15,091,300	14,849,100	16,040,500	16,050,000	16,100,000	16,353,400	15,278,200	16,340,800	15,589,000	16,454,200	15,150,000[1]	15,680,000
Venezuela	12,628,067	13,151,362	13,681,619	13,152,766	13,389,789	13,487,089	12,849,480	13,432,671	13,442,870	13,722,933	12,486,600	14,566,510
Roumania	5,030,000	4,932,000	5,181,000	5,215,000	5,361,000	5,242,000	4,809,000	5,209,000	5,226,000	5,568,000	5,563,000	5,606,000
Iran[2]	4,634,000	4,270,000	4,109,000	4,522,000	4,816,000	4,627,000	4,480,000	4,641,000	4,312,000	5,376,000	5,061,000	4,756,423
Netherland India	3,699,430	3,661,259	3,767,596	3,528,889	3,612,056	3,614,436	3,407,194	3,670,877	3,532,375	3,721,613	3,549,417	3,725,491
Mexico	3,570,908	3,442,259	3,461,457	3,340,713	3,666,265	3,377,302	3,285,965	3,542,088	2,997,883	3,235,255	3,167,300	3,179,557
Iraq	2,166,794	1,962,541	2,374,393	2,309,867	2,240,819	2,327,332	2,107,210	2,515,345	2,048,053	2,467,136	2,473,660	2,440,669
Colombia[3]	1,576,307	1,555,676	1,623,372	1,582,952	1,004,474	1,611,618	1,475,403	1,619,620	1,427,193	1,598,544	1,529,901	1,585,345
Peru	1,442,565	1,448,133	1,493,236	1,343,848	1,381,031	1,377,006	1,293,627	1,351,810	1,403,626	1,500,485	1,452,306	1,524,303
Argentina	1,198,537	1,152,919	1,200,698	1,193,434	1,304,554	1,310,129	1,273,243	1,366,691	1,260,277	1,231,354	1,257,390[1]	1,317,004
Trinidad	1,003,382	992,445	1,015,492	1,078,957	1,086,530	1,079,082	983,424	1,081,191	1,026,423	1,066,728	1,078,186	1,121,583
British India	796,150	775,133	790,612	649,041	841,764	854,644	756,384	791,162	735,660[1]	784,300[1]	774,120[1]	799,924
Poland	315,000	301,000	308,000	294,000	308,000	338,800	323,400	338,800	323,400	331,100	287,000	308,000
Brunei	281,400	256,480	233,310	242,900	274,540	253,400	237,930	257,250	270,900	225,890	206,780	266,700
Germany	241,801	229,712	232,659	236,789	263,879	254,492	227,444	274,393	246,519	244,552	256,613	272,699
Japan	152,290	144,312	158,165	145,749	147,827	183,651	165,877	196,569	194,167	203,071	198,387	199,381
Sarawak	154,000	145,600	148,400	141,400	140,700	139,300	127,050	136,290	130,900	134,610	128,660	130,200
Ecuador	135,549	138,986	147,449	143,518	146,541	148,980	138,721	162,125	159,666	163,855	156,703	163,714
Canada[4]	117,652	123,919	122,525	116,756	125,658	121,231	107,928	117,824	107,748	114,297	112,950[1]	115,041
Egypt	104,937	100,954	103,341	96,495	94,969	91,497	97,573	111,846	101,038	107,989	106,694	106,260
France[1]	46,312	43,530	44,981	43,530	44,981	44,981	42,079	44,981	43,530	44,981	43,530	44,981
Bahrein[1]	105,400	105,400	105,400	105,400	105,400	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Others[1]	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
Total	139,373,781	137,966,720	144,578,205	142,084,014	145,242,777	146,032,370	135,962,132	148,145,333	145,433,228	152,410,893	145,600,277	149,750,985

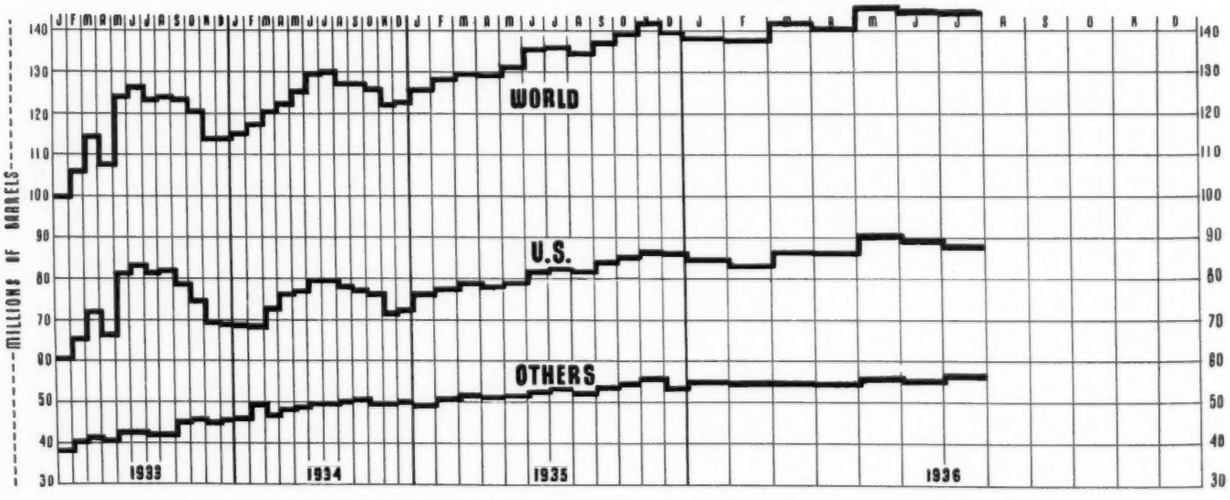
[1] Estimate. [2] Anglo-Iranian Oil Co. figures revised; fuel oil returned to the ground has been deducted. [3] International Petroleum Company's figures. [4] International Petroleum Company and Lobitos Oilfields Ltd. figures. [5] Includes natural gas production.

Russian Sakhalin included with Russia. Japanese Sakhalin included with Japan.

Official Crude Oil Production Figures for 1932 to 1936

	Total 1936	Daily Average 1936	Total 1935	Daily Average 1935	Total 1934	Daily Average 1934	Total 1933	Daily Average 1933	Total 1932	Daily Average 1932
United States	627,377,200	2,945,433	993,942,000	2,723,129	909,107,000	2,490,704	898,874,000	2,462,670	785,159,000	2,145,243
Russia	110,845,600	520,402	176,688,100	469,608	168,648,700	462,051	149,901,900	407,950	149,719,000	409,070
Venezuela	93,988,153	441,259	153,932,611	421,733	140,784,805	385,712	120,882,802	331,186	119,596,512	326,766
Roumania	37,223,000	174,756	61,150,000	167,534	62,006,000	169,879	50,971,200	139,647	50,491,205	137,954
Iran	33,253,423	156,119	52,413,879	143,600	52,663,782	144,284	48,581,280	135,840	45,122,455	123,285
Netherland India	25,221,403	118,410	42,569,625	116,629	42,289,408	115,861	38,512,663	105,516	39,584,027	108,153
Mexico	22,785,430	106,974	40,234,902	110,233	38,167,022	104,567	33,904,882	92,890	32,802,285	89,624
Iraq	16,379,405	76,899	24,850,924	68,085	7,935,657	21,742	1,200,000	3,288	1,200,000	3,300
Colombia	10,847,624	50,928	17,617,654	48,740	17,340,724	47,509	13,157,127	36,047	16,384,956	44,768
Peru	9,903,163	46,494	16,835,206	46,270	15,936,937	43,663	13,923,281	38,146	9,899,266	26,026
Argentina	9,016,088	42,329	14,317,500	39,226	14,045,652	39,015	13,759,565	38,232	13,166,900	35,975
Trinidad	7,436,617	34,914	11,669,792	31,686	10,894,363	29,847	9,560,039	26,192	10,023,780	27,387
British India	5,496,194	25,804	9,227,496	25,281	8,997,399	24,650	8,721,655	23,893	8,600,312	23,500
Poland	2,250,500	10,566	3,973,200	10,885	3,697,617	10,130	3,858,085	10,570	3,905,230	10,670
Brunei	1,718,850	8,070	3,162,614	8,647	2,673,041	7,323				
Germany	1,776,712	8,341	3,054,023	8,409	2,266,964	6,211	1,712,823	4,692	1,824,019	4,983
Japan	1,341,103	6,296	1,848,656	5,065	1,484,962	4,068	1,337,761	3,827	1,575,333	4,375
Sarawak	927,010	4,352	1,811,297	5,002	1,948,044	5,337	2,289,472	6,273	2,274,043	6,213
Ecuador	1,093,764	5,135	1,725,354	4,727	1,655,062	4,534	1,622,624	4,446	1,573,857	4,300
Canada	797,019	3,742	1,434,467	3,930	1,418,810	3,887	1,147,825	3,144	1,054,373	2,880
Egypt	722,897	3,394	1,215,606	3,356	1,479,037	4,052	1,591,495	4,360	1,742,370	4,760
France	309,063	1,451	529,664	1,451	552,000	1,512	552,000	1,515	552,000	1,508
Bahrein	2,100,000	9,859	1,264,809	3,465	285,071	781				
Others	525,000	2,465	900,000	2,470	861,000	2,359	432,000	1,184	432,000	1,180
	1,023,335,218	4,804,392	1,636,369,379	4,470,161	1,507,139,057	4,129,678	1,417,534,479	3,884,022	1,296,682,923	3,544,940

Official Crude Oil Production Figures for 1932 to 1936



World crude oil production by months, 1933-1936. Chart is weighted to compensate for variation in number of days per month. Ratio of U. S. crude production to world production.

U. S. S. R.

Official Figures for Soviet Oil Operations

	Crude Production (bbl.)	Daily Average (bbl.)	Runs to Stills (bbl.)	Drilling (feet)
1936				
January	16,353,400	527,529	13,993,000	509,950
February	15,278,200	526,731	13,055,000	516,150
March	16,340,800	527,122	13,860,000	566,300
April	15,589,000	519,633	13,418,300	619,420
May	16,454,200	530,786	14,356,300	566,600
June	15,150,000	505,000	13,750,000	565,000
July	15,680,000	506,000	14,100,000	560,000
Total 7 months 1936	110,845,600	520,402	96,532,600	3,903,420
Total 7 months 1935	98,557,200	464,846	89,607,100	2,693,775
Total 1935	176,688,100	497,713	146,705,100	4,868,465
Quota 1935	212,310,000	580,082	171,500,000	5,214,000
Quota 1936	213,500,000	584,931	175,000,000	7,100,000

Crude conversion: seven bbl. = one ton.

OF ALL the outstanding features of Soviet oil operations during the first seven months of 1936, most important is the considerable improvement which has taken place in runs to stills and refinery operations.

The operating cycles of many installations of Soviet design and construction, as well as of imported refineries, were extended to 325–350 days of the year instead of the usual 300 days allowed by the designers. In the case of the volume of distillate cuts made per cubmeter of furnace surface of the installations, bold experiments were successfully made to increase the same from the allowable volume of 277 kilograms per cubmeter to 320 kilograms, while actual figures obtained at the Baku shell stills were as high as 329 kilograms, which is in excess of the new norms and even in excess of expectations.

No appreciable change has taken place in Soviet crude production during the month of July and operation of all Soviet fields has remained within the usual limits. With the exception of the Lenin group of Baku oil fields and the Kaganovitch field of Baku, which show plan fulfillment and even some excess over the quota, none of the Soviet oil producing properties have been able to live up to plans. The total for all Baku fields is about 93 percent of the plan for the month, individual field groups having operated on individual days as low as 80 and as high as 96 percent of the plan.

On June 26 a general Conference of the Council of the Commissariat for Soviet Heavy Industries was called at Moscow under the chairmanship of S. Ordzonikidze assisted by Rukhimovitch, Piatakov, as well as all members of the board. In addition, 150 guests were present representing all other important industries, trade and commerce of modern Russia.

In opening the conference, S. Ordzonikidze emphasized the importance of oil to the Soviet national economy and accorded the representatives of the Soviet oil industry the honor of making the first speeches. The speeches were made in unexcelled frankness and fullest self-criticism, and from them one is bound to get a vivid picture of the Soviet oil industry and prevailing conditions.

The high executives of the Commissariat for Soviet Heavy Industries, as well as the heads of the Soviet oil organizations, have opened the books in order to show the accounts and we shall endeavor in the following quotations to bring out the highlights of the speeches delivered.

S. Slutzki (head of all Baku oil industry) stated that since the December session of the Central Committee of the Communist Party, when it was openly stated that the Stakhanoff spirit of speeding up operations had found no reflection whatsoever in the oil industry, considerable improvements in drilling (and perhaps also in production) had taken place. Individual drilling operators have evidenced considerable progress, enabling them to approach more nearly American field practice, but the management has lacked the efficiency and experience necessary to strengthen and follow up these individual efforts. The average drilling speed of Baku has increased to 1,500 and even 1,600 ft. per table per month, as against the quota of 1,380 ft., but the gap between completion of wells and bringing them under operation is steadily widening. In spite of the fact that much more prospecting is required, the total reserves of Baku oil lands surveyed for operation is steadily diminishing from year to year. These reserves were double the requirements in 1934, only 1½ times the requirements in 1935, and only 1.2 times the requirements at present.

It is true that 100 new properties were added in 1936 but these cover only 26 percent of the plan. Baku will undoubtedly lift 144,000,000 bbl. of crude in 1936 but it will have to produce about 200,000,000 bbl. in order to meet the increasing demands.

During the first five months of 1936 a total of 435 wells were completed at all Baku fields as against 485 wells planned. These arrears of 50 wells have not only affected the statistical showing, but have increased the cost of drilling 25 to 30 Rbl. per meter above the estimates and lowered the general efficiency. Cave-ins at wells have been excessive even at comparatively shallow depths. Blending of the mud streams and drilling by means of casing directly has not alleviated the situation; moreover increasing breakdowns are eating up almost 25 percent of the time required for drilling. Lifting of drilling strings requires much more time than it should, deep pumping and compressor production is below the expected average, due largely to poor operation of the auxiliaries. As of today production per well at Baku, amounting to 410 tons, is only slightly below the required 418 tons, but of a total of 7,000 wells registered for production at Baku fields only 4,216 wells are under operation while 4,672 wells are required to operate in order to live up to plans: 674 wells were completed at Baku during the first five months of 1936 as against 915 wells required. Thirty percent of the total Baku crude is derived from two percent of the wells in operation, the other 98 percent supplying the balance of 70 percent. Obviously, any deficiency in operation of this two percent is bound to lower the total production at least 35,000 bbl. per day, and it is also evident that with only 4,216 wells in operation out of a total of 7,000 wells drilled and completed the ratio of idle wells to the total is decidedly too high.

Soviet Oil Exports

(tons)

	1936 Jan.–April	1935 Jan.–April
Crude	152	96
Gasoline	174,162	247,797
Kerosene	138,196	146,714
Gas oil	156,281	139,242
Lube oil	84,257	78,997
Diesel oil	33,795	30,829
Fuel oil	350,366	467,462
Others	1,987	2,964
Total	939,196	1,114,101
Value in Rbl.	53,284,000	58,215,000

Exports to Major Countries

(tons)

France	154,067	94,758
England	107,199	118,487
Germany	82,902	131,931
Sweden	40,231	58,784
Italy	35,431	108,402
Denmark	35,305	46,533
Belgium-Luxemburg	29,231	36,950
Spain	23,630	62,734
Japan	18,839	18,460
So. Africa	13,769	11,390
Turkey	10,743	16,401
All others	387,849	408,971

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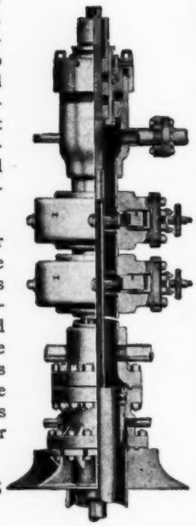

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Hermetized operation of wells and transportation is still unknown in Soviet fields, and the losses from evaporation are beyond estimation. The Soviet field technique has remained practically unchanged since 1923–1926, when A. Serebrovsky introduced the first innovations from the United States. Since then, however, all requirements have changed, the depths of Soviet wells having increased from 2,000–2,400 ft. to 6,000 and 6,500 ft.

Unless all 1,500 idle wells of Baku are made to operate, the required 26,000,000 bbl. of crude production for Baku fields in 1937 will never be achieved. These wells would immediately increase the daily average of Baku crude at least 42,000–45,000 bbl.

The refineries of Baku are operating in excess of plan in runs to stills as well as in the output of distillates, but the evaporating losses are excessive.

Mr. Slutzki concluded his speech with the complaint that the oil fields are poorly supplied with pipe, metals, electrical equipment and so forth, and stated that if this shortcoming could be removed all the arrears incurred during the first half of 1936 would be balanced during the second half of the year.

S. Rosenoer, of Grozni, believes that thanks to the Stakhanoff movement Grozni will ultimately come out of all arrears. Considerable progress has been made in drilling. The speed has increased from the pledged 1,980 ft. per table per month to 2,475 ft. during the first quarter of 1936, to 3,700 ft. in May, and to over 4,000 ft. at present. The entire technique of drilling, including every detail, has been revamped and improved but prospecting is still lagging and drilling speed under prospecting does not exceed 925 ft. per table per month.

Production at Grozni during the first six months of 1936 shows an increase of 20 percent over last year, but the arrears against plan have almost wiped out the improvement. The major proportion of the arrears in production were incurred from the old wells, while the new wells are also producing less than expected and it will apparently require a good break in flush production in order to effect a genuine comeback of Grozni, now long overdue.

Izberbash, now ready for commercial production, and Molgabek, Gudermas and Taimas Kale, which are under development at present, are likely to permit a 25–30 percent increase in production during 1937 over the corresponding figure for 1935.

S. Ganshin spoke of Bashkiria as being the youngest and, compared with Baku and Grozni, the smallest Soviet oil field, but it is now rapidly overtaking Maikop in the race for third place. The drilling plan for the first half of 1936 was completed 12 days ahead of time and of the 48 wells which were to be completed in 1936, 25 wells were made ready for operation during the first five months of the year, but, he continued, we are behind plan in prospecting of new lands.

We have increased the rate of drilling to 1,150 ft. as compared with 800 ft. last year, and are doing our best to correct the high rate of breakdowns which now approximate 25 percent. By specializing all operations we were able to cut the number of men engaged in rig building from 251 in January to 136 in June, and at the same time we have also reduced the time necessary for building a rig from 1,536 to only 955 man-hours and in individual cases to 455 man-hours. We have likewise done our best to improve the supply of commodities for labor, and have improved housing facilities and stopped liquidity of labor, thus considerably improving labor productivity. We have standardized our drilling in the form of using disc bits and have improved the speed per bit hour from 4.3 ft. to 7.25 ft. (U. S.-16 ft.). Cost of drilling is still high, owing to breakdowns, but we have consistently decreased the cost per meter (3.3 ft.) from 250 Rbl. to 187 and even to 160 Rbl. Illiteracy is high. Of 5,456 laborers engaged and employed in the field 1,055 are totally illiterate and 1,050 semi-illiterate, and lack of technical skill of the others slows up expected progress.

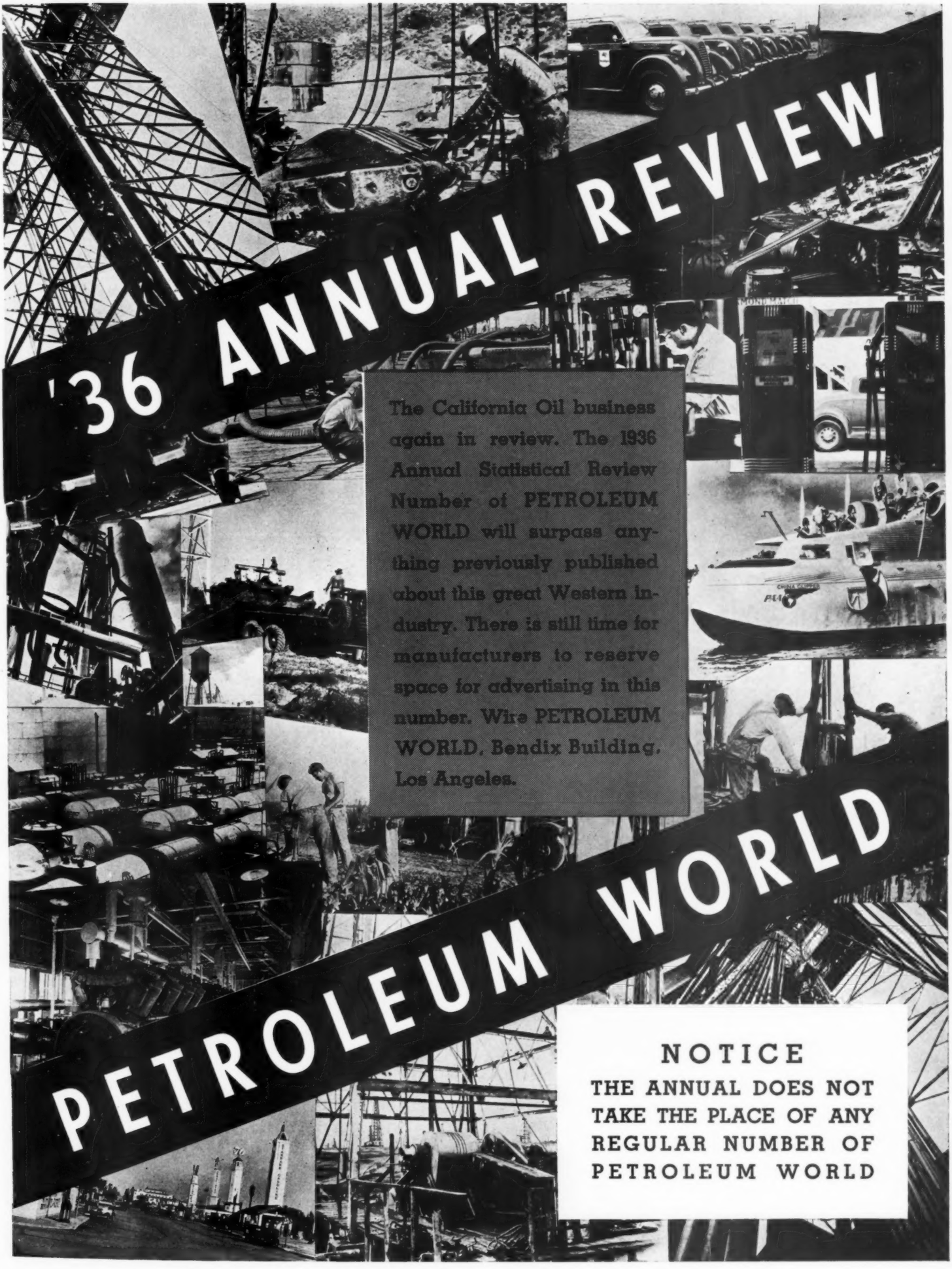
Of 100 wells completed at Bashkiria by the end of June only 48 were in operation, the others not yet being equipped. Owing to lack of pumps and other means of mechanical production only five wells are under mechanical operation and most of the wells are of average or below-average production. The daily average of 24,000 bbl. per day is slightly below plan. We could easily get 28,000 bbl. per day with gushers, but we avoid gushers as we intend to build up a steady, reliable production —unlike other Soviet fields where gushers are being hunted.

Bashkiria is in the making and the success of Bashkiria means the success of the Soviet oil base in the east. Bashkiria has less resources than Baku or Grozni, but together with Utch Kizil in Middleasia, Koschagil in Emba, and the recent discoveries along the Kama and at Sizran, it is not unlikely that a group of oil fields not in the least inferior to Baku will be formed.

S. Ordzonikidze closed the Conference by referring to the fact that oil men came to the meeting in good faith, entirely unlike former occasions when they came only to make complaints. He continued:

"We formerly asked only 600 meters drilling speed and they insisted on 450 meters as the maximum possible. Now they give 1,000 and are ready to double this figure. Imagine the drilling of a well 1,000 meters deep in 10–12 days instead of the former 12 and 14 months. The drillers have made good but we hope this will not cause self-satisfaction and result in indifference. Soviet crude production has become stabilized. Why? Peterson of Baku tells me that the Stakhanoff tempo of operations was not applied to key regions. Bortz of Baku tells me that the supervision forces have not become Stakhanov conscious. Conservatism reigns in the operation of old wells and the old wells produce 90 percent of all Grozni production. Lack of Stakhanov tempo exists everywhere. Why? Who should introduce Stakhanovism in the oil industry other than the heads of the oil industry? Baku, Grozni and other Soviet fields are forging ahead of the plan minus Stakhanov tempo—what would the showings have looked like under Stakhanov tempo?

"Refinery operations are up to plans, but of what significance is this without sufficient production, drilling and prospecting? Maikop



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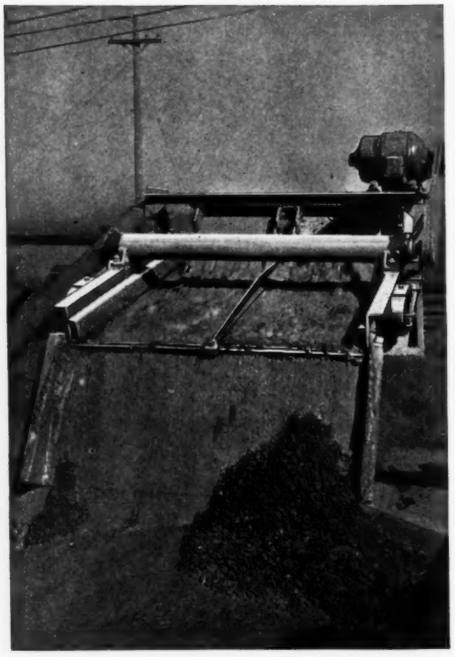

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has the finest drilling showings but little oil; Grozni has hopes of improving shortly; Baku hopes to increase production in 1937 to 182,000,000 bbl. of crude; S. Ganshin expects to increase production 50 percent during next year. This is all very well, but we must not forget that drilling and prospecting are the first prerequisites for successful fulfillment of plans and pledges.

"We expect the oil industry to live up to plans and to forge ahead."

Correction

On page 324 of the June issue of WORLD PETROLEUM, Soviet capitalization of the oil industry for 1936 was referred to as 100,000,000 Rbl. This figure should have been 1,000,000,000 Rbl. M. V. Barinoff, while on a visit to the United States, further revised this figure to 1,400,000,000 Rbl.

On page 422 (22nd line) of the August issue, the sentence reading "When Grozni production plans for 1934 and 1935 were being prepared the optimistic figure of 500,000 tons per annum was decided upon" should have continued, "from the new areas under prospecting such as Achisu, Izberbash and Molgabek." (Note: Grozni production during 1933, 1934 and 1935 has averaged 3,500,000 tons per year.) J. WEGRIN

▼

Austrian Oil Production

(Continued from page 438)

meters per minute. The hole has been abandoned for the present but good results could probably be attained at greater depths.

The sarmatian oil from Gösting No. 2, the production of the higher horizons of Gösting No. 4, and the upper slate zone oil from Gösting No. 1 are all very similar to one another in quality. These oils are also similar to the upper sarmatian oil obtained from Göding and the sarmatian oil taken from Gbely. They are heavy, thick oils with an asphalt base containing no benzine, little kerosene, some gas oil, and a large percentage of lubricating oil and residuals:

Properties of Austrian Oil

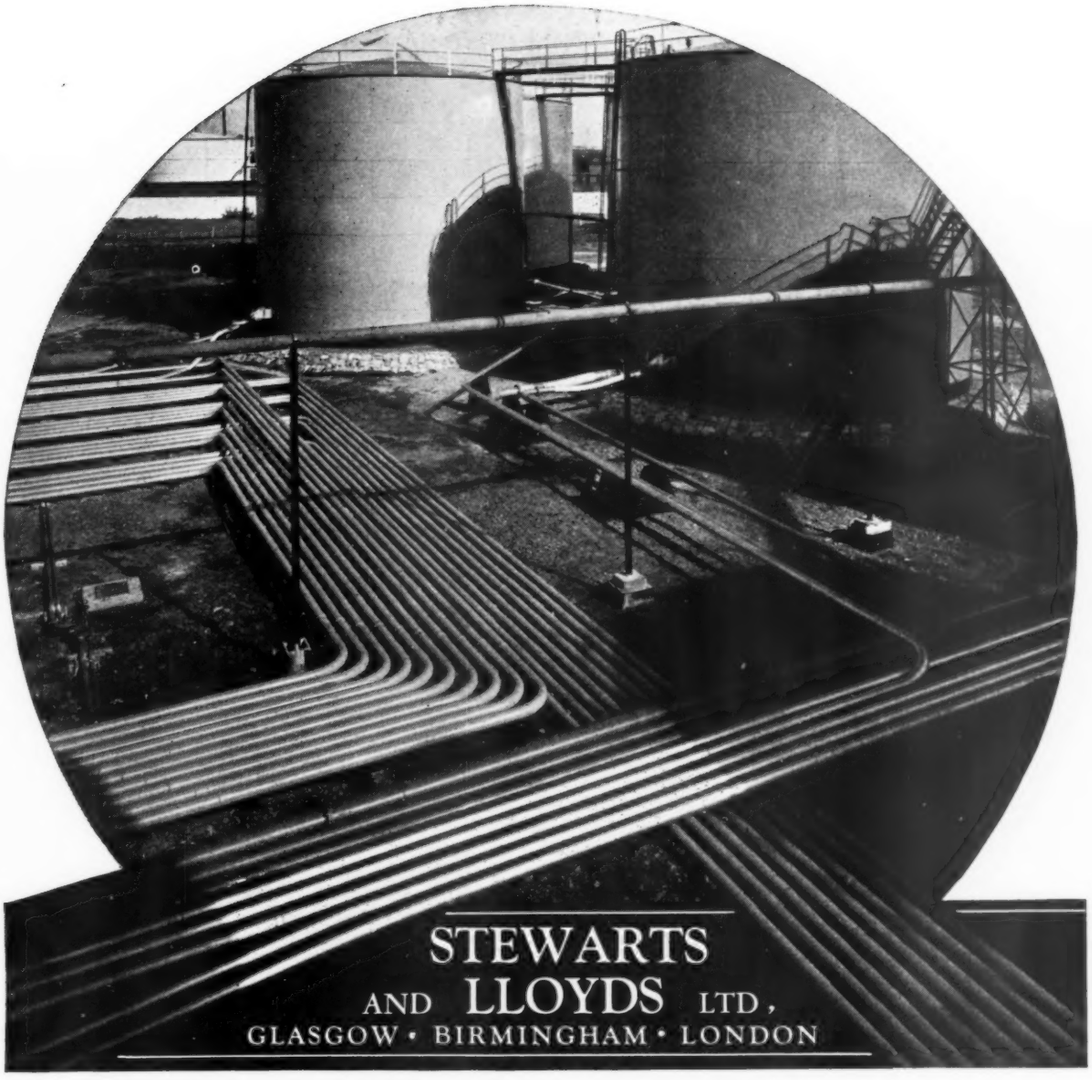
	Gösting No. 1 (785 m.)	Gösting No. 2 (926 m.)	Gösting No. 4 (1,107 m.)
Spec. gravity	0.939	0.938	0.946
Viscosity at 20° C.	65.6 E.	79 E.	....
at 50° C.	8.9 E.	....	12.2 E.
Flash	120° C.	127° C.	138° C.
M.P. (still liquid)	−20° C.	−20° C.	−15° C.
Refined oil (distill. up to 300° C.)	11.5%	8%	5%
Gas oil (up to 350° C.)	....	28%	23%
Heavy oil and Residuals	88.5%	64%	72%

The crude obtained from the wells in Windisch-Baumgarten (1930) and that taken from Gösting No. 1 after further drilling to 926 meters was somewhat better, both containing some benzine and paraffin:

Properties of Austrian Oil

	Windisch-Baumgarten	Gösting No. 1 (926 m.)
Up to 150°	1.1%	1.5%
200°	4.9%	2.−%
250°	10.2%	9.3%
300°	22.2%	17.6%
330°	50.3%	60.4%
Above 330°	11.3%	9.2%

The oil from sources more recently discovered, especially from the slate formation of Neusiedl, also shows more desirable properties, containing both benzine and paraffin:



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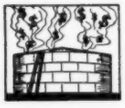

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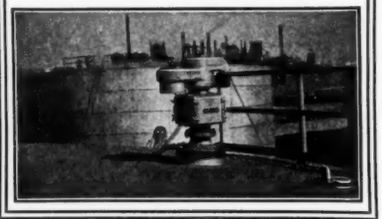

Properties of Austrian Oil

	Gösting No. 4 (1,290 m.)	Neusiedl a.Z.
Spec. gravity	0.905	0.859
Benzine	3%	8%
Refined oil	10%	16%
Gas oil	30%	18%
Heavy oil & Residuals	57%	58%

These factors lead one to hope for higher quality crude oil as deeper wells are sunk. Benzine and paraffin content increases in oil from greater depths. At Göding different quality oil was taken even from the same horizon (upper ledge of Tortona) depending upon whether it originated from the higher or lower sole on either side of the longitudinal fault.

The successful results achieved thus far on the Steinberg have confirmed the views of the writer that here the cleft slate subsoil, as well as the sarmatian formation, contains oil that can be commercially produced. This was further proven when Raky-Danubia recently reopened their well at Windisch-Baumgarten, where in addition to an extensive gas eruption (seven cubic meters per minute) an apparently light oil was found.

On the basis of data gained during the past few years, it would appear that the most productive sarmatian formations are those which adjoin slate formation; higher sand horizons, more distant from the slate ledges, have all too frequently been found to be dry. It is possible that the sarmatian oil has migrated from crevasses of the slate formations, but it should not be concluded that sarmatian deposits occur in Austria only adjoining slate formations. It is probable that the oil originates neither in the sarmatian nor slate formation. Schlier rock migrates below the slate formations to an extent unknown by us, and Schlier oil-bearing minerals are probably deposited with the deepest sediments in the Vienna basin.

The now recognized importance of the slate formation as an oil-bearing strata opens favorable prospects for various districts where slate formation lies below the solidified neocene beds. Indications of gas and oil have also been obtained in other neocene areas in Austria, such as the Graz basin, where wells have been sunk at Radkersburg and Mooskirchen and traces of oil have been found at Burgau.

New interest also centers about the Alpine sandstone zone, an area in which the presence of oil has been a disputed question for some time. When 15 years ago the writer stated that the northern border of the slate zone and the adjoining stretch of the footlands was oil-bearing territory, his views did not meet with the approval of the Austrian geological authorities then sitting in Vienna. Since that time, in addition to the previously noted gas production, traces of oil have been found at Anzbach in 1920, at Hammerau (near Salzburg) in 1922, and about 100 liters of light crude oil were lifted from a water well at Kierling.

Today there is no longer any question as to the presence of oil in Austria. Besides the oil regions already discovered there are very likely other sections containing oil, which will be found only in due time as prospecting operations progress and become more systematic. Right now a major problem is the lack of capital, as little Austria is unable to provide the necessary capital herself, and international capital thinks of Austria primarily as a consuming country.

It's a long hole that has no turning

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Mosul Oil Fields Change Hands

(Continued from page 431)

velopment of oil production in the western part of Iraq.

While the Iraq Petroleum Company is a private corporation approximately a quarter interest in it is held by Anglo-Iranian Oil Company in which the British government owns a half interest. Another quarter belongs to Cie. Francaise des Petroles, which in turn is partly owned by the French government. In view of the interests of these two governments in Iraq and Syria it is considered quite within the range of possibility that they may prefer not to have a third power interjected into the situation.

Under the original contract of the Iraq Petroleum Co., as successor to the Turkish Petroleum Co., with the government of Iraq the company was required, after a period of exploration, to designate a number of plots of specified size which it would retain, leaving alternate plots to the possession of the government. This was replaced in 1931 by a new agreement by which the company relinquished its claim to any territory west of the Tigris river and received full rights to all territory eastward of the river within the vilayets of Baghdad and Mosul.

At the time two reasons were assigned for this change. One was the advantage,

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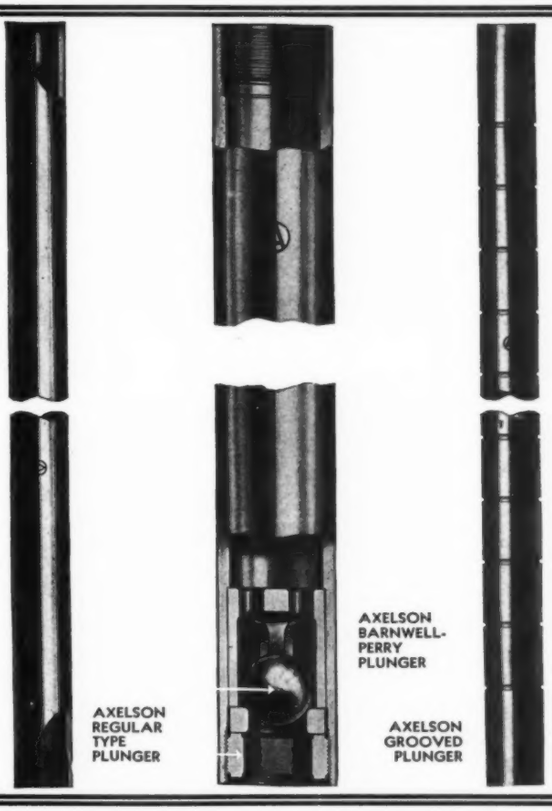

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from the viewpoint of the company, of having full control of whatever field it occupied so that it could be developed on a unit basis in the manner economically most advantageous. The other was the expressed belief that the western area, while undoubtedly containing petroleum deposits, was less valuable than the eastern section.

Directly after this agreement was made a new company, called the British Oil Development Co. Ltd., obtained from the Iraq government a concession covering some 40,000 square miles west of the Tigris. By the terms of the concession the government was to receive 20 percent of the oil produced and the company was to pay a royalty of five shillings gold per ton on its share of production. The company was to construct a pipe line or railway capable of conveying 1,000,000 tons yearly to the Mediterranean. Pending the period of production at this rate the company was to pay to the government an annual rental of £500,000. It was also specified that British Oil Development Company should remain a British corporation and have its main office in England.

In the beginning the company was controlled and officered by London capitalists, some of whom were identified with oil though not with the interests active in the Iraq Petroleum Company. Others were entirely outside the petroleum field. Considerable blocks of shares were held also by German and Swiss groups. Subsequently the Italians came into the company as it became necessary to provide additional capital to meet the yearly payments and carry on development work. Within the past two years their holdings were greatly increased until they apparently were in a majority, as the number of their directors would indicate. It was at this point apparently that those concerned with the Iraq Petroleum Company became interested in extending their control to the B.O.D.

Mosul Oilfields Ltd. was organized in 1932 to acquire the shares of the B.O.D. and to act as the operator of the concession. Its authorized share capital was £2,333,333 of which £1,069,289 had been issued up to the end of last year. Some thirty wells have been drilled, some of which are said to be large producers, but precise information on this point has not been divulged.

While no statement as to the future program of the Mosul Company has been issued since the changes in directorships it is assumed that the development of its territory will proceed in accordance with the provisions of its concession. If this is done it should result presently in a substantial addition to the supply of oil emanating from Iraq.

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